

# **SITE MANAGEMENT PLAN**

**Brownfield Cleanup Program**

**585 Union Street Site**

**585 Union Street, Brooklyn, New York**

**New York City Tax Map Designation: Section 1, Block 203, Lot 51.61**

**NYSDEC BCP Site Number: C224329**

**Prepared for:**

Gowanus Union Street LLC

19 West 24<sup>th</sup> Street, 12<sup>th</sup> Floor

New York, NY 10010

**Submitted to:**

New York State Department of Environmental Conservation

Region 2, Division of Environmental Remediation

625 Broadway, Albany, NY 12233-7020

**August 2023**

**Updated November 2023**

**IEC Project Number: 14729**



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CERTIFICATION STATEMENT

I XIN YUAN, certify that I am currently a NYS registered professional engineer as in defined in 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 DER Technical Guidance for Site Investigation and Remediation (DER-10).



\_\_\_\_\_ P.E.

11/22/23

DATE



## TABLE OF CONTENTS

ES	EXECUTIVE SUMMARY .....	6
1.0	Introduction .....	9
1.1	General.....	9
1.2	Revisions .....	10
1.3	Notifications.....	10
2.0	SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS.....	2
2.1	Site Location and Description .....	2
2.2	Physical Setting .....	2
2.2.1	Land Use.....	2
2.2.2	Geology .....	2
	Hydrogeology .....	3
2.2.3	3	
2.3	Investigation and Remedial History .....	4
2.4	Remedial Action Objectives .....	12
	<b>Soil</b> .....	12
2.5	Remaining Contamination .....	13
2.5.1	Soil.....	13
2.5.2	Groundwater.....	14
2.5.3	Soil Vapor .....	15
3.0	INSTITUTIONAL AND ENGINEERING CONTROL PLAN .....	17
3.1	General.....	17
3.2	Institutional Controls .....	17
3.3	Engineering Controls.....	19
3.3.1	Cover (or Cap) .....	19
3.3.3.1	Cover (or Cap).....	19
4.	Monitoring and sampling plan.....	20
4.1	General.....	20
4.2	Site – wide Inspection .....	20
4.4	Post-Remediation Media Monitoring and Sampling.....	22
4.4.1	Soil Vapor/Indoor Air Assessment .....	22
4.4.2	Groundwater Sampling .....	24
5.0	OPERATION AND MAINTENANCE PLAN.....	27

5.1	General.....	27
6.0	PERIODIC ASSESSMENTS/EVALUATIONS .....	27
6.1	Climate Change Vulnerability Assessment.....	27
6.2	Green Remediation Evaluation .....	28
7.0.	REPORTING REQUIREMENTS .....	29
7.1	Site Management Reports .....	29
7.2	Periodic Review Report.....	31
7.2.1	Certification of Institutional and Engineering Controls .....	33
7.3	Corrective Measures Work Plan .....	34
7.4	Remedial Site Optimization (RSO) Report.....	35
8.0	REFERENCES.....	36



## Tables

---

	<u>Page</u>
Notifications.....	1
Groundwater Elevation .....	Attached
Groundwater Analytical Table .....	15
Well Construction Details .....	25
Post Remediation Media Monitoring	25
Schedule of Interim Monitoring/Inspection Report	26

## Figures

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<b>Figure 1:</b>	Site Location Map
<b>Figure 2:</b>	Site Boundaries
<b>Figure 3:</b>	Site Layout Map
<b>Figure 4:</b>	Geologic Cross Section
<b>Figure 5:</b>	Groundwater Contour Map
<b>Figure 6:</b>	Track 4 Remedial Plan
<b>Figure 7:</b>	Groundwater Monitoring Well Locations and Analytical Results
<b>Figure 8:</b>	Proposed Soil Vapor Intrusion Sample Locations
<b>Figure 9:</b>	IC Boundary Map
<b>Figure 10:</b>	Cover System

## Appendices

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<b>Appendix 1:</b>	Environmental Easement
<b>Appendix 2:</b>	List of Contacts
<b>Appendix 3:</b>	Boring Logs
<b>Appendix 4:</b>	Groundwater Well Construction Logs
<b>Appendix 5:</b>	Excavation Work Plan
<b>Appendix 6:</b>	HASP and CAMP
<b>Appendix 7:</b>	QAPP
<b>Appendix 8:</b>	Site Management Forms

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**ACRONYMS AND ABBREVIATIONS**

<b>AMSL</b>	Above Mean Sea Level	<b>OER</b>	Office of Environmental Remediation
<b>AST</b>	Aboveground Storage Tank	<b>ORP</b>	Oxidation-Reduction Potential
<b>ASTM</b>	American Society for Testing and Materials	<b>PPM</b>	Parts Per Million
<b>AOC</b>	Area of Concern	<b>PPB</b>	Parts Per Billion
<b>ASP</b>	Analytical Services Protocol	<b>PCB</b>	Poly Chlorinated Biphenyl's
<b>BCP</b>	Brownfield Cleanup Program	<b>PAH</b>	Poly Aromatic Hydrocarbons
<b>BGS</b>	Below Grade Surface	<b>PCE</b>	Tetrachloroethene
<b>BTEX</b>	Benzene Toluene Ethylbenzene and Xylenes	<b>PGW</b>	Protection of Groundwater
<b>BER</b>	Business Environmental Risk	<b>PID</b>	Photo Ionization Detector
<b>CPP</b>	Citizen Participation Plan	<b>PFAS</b>	Per- and Polyfluoroalkyl Substances
<b>CO</b>	Certificate of Occupancy	<b>PVC</b>	Polyvinyl Chloride
<b>CSM</b>	Conceptual Site Model	<b>QAQC</b>	Quality Assurance Quality Control
<b>cVOC</b>	Chlorinated Volatile Organic Compound	<b>QAPP</b>	Quality Assurance Project Plan
<b>CREC</b>	Controlled Recognized Environmental Condition	<b>RIWP</b>	Remedial Investigation Work Plan
<b>CEQR</b>	City Environmental Quality Review	<b>RCRA</b>	Resource Conservation and Recovery Act
<b>CAMP</b>	Community Air Monitoring Program	<b>REC</b>	Recognized Environmental Condition
<b>CLP</b>	Contract Laboratory Program	<b>RAO</b>	Remedial Action Alternative
<b>DER</b>	Division of Environmental Remediation	<b>RAWP</b>	Remedial Action Work Plan
<b>DOB</b>	Department of Buildings	<b>RIR</b>	Remedial Investigation Report
<b>DNAPL</b>	Dense Non-Aqueous Phase Liquid	<b>SF</b>	Square Feet
<b>DUSR</b>	Data Usability Summary Report	<b>SHWS</b>	State Hazardous Waste Site
<b>DO</b>	Dissolved Oxygen	<b>SVOC</b>	Semi-Volatile Organic Compound
<b>EDR</b>	Environmental Data Resources	<b>SCO</b>	Soil Cleanup Objective
<b>EIS</b>	Environmental Impact Statement	<b>SSDS</b>	Sub-Slab Depressurization System
<b>ELAP</b>	Environmental Laboratory Accreditation Program	<b>TAGM</b>	Technical and Administrative Guidance Memorandum
<b>ESA</b>	Environmental Site Assessment	<b>TCE</b>	Trichloroethylene
<b>FWRIA</b>	Fish and Wildlife Risk Impact Analysis	<b>TCL</b>	Target Compound List
<b>FBG</b>	Feet Below Grade	<b>TIC</b>	Tentatively Identified Compound
<b>AWQS</b>	Ambient Water Quality Standard	<b>TAL</b>	Target Analyte List
<b>GPR</b>	Ground Penetrating Radar	<b>USGS</b>	United States Geological Survey
<b>GPS</b>	Global Positioning System	<b>USFWS</b>	United States Fish and Wildlife Service
<b>HREC</b>	Historical Recognized Environmental Condition	<b>µg/kg</b>	Micrograms Per Kilogram
<b>HASP</b>	Health and Safety Plan	<b>µg/m<sup>3</sup></b>	Micrograms Per Cubic Meter
<b>LLC</b>	Limited Liability Corporation	<b>USCS</b>	Unified Soil Classification System
<b>MW</b>	Monitoring Well	<b>UST</b>	Underground Storage Tank
<b>MS</b>	Matrix Spike	<b>USEPA</b>	United States Environmental Protection Agency
<b>MSD</b>	Matrix Spike Duplicate	<b>VCP</b>	Voluntary Cleanup Program
<b>NYSDEC</b>	New York State Department of Environmental Conservation	<b>VOC</b>	Volatile Organic Compound
<b>NYC</b>	New York City		
<b>NYCDEP</b>	New York City Department of Environmental Protection		
<b>NYSDOH</b>	New York State Department of Health		
<b>NYCRR</b>	New York Codes Rules and Regulations		
<b>NAPL</b>	Non-Aqueous Phase Liquid		
<b>NYSDOT</b>	New York State Department of Transportation		

**ES EXECUTIVE SUMMARY**

This Site Management Plan (SMP) is a required element of the remedial program for the 585 Union Street Site located in Brooklyn, New York, which achieved a site-specific Track 4 remedy. After completion of the remedial work, some contamination was left at this Site, the SMP will be in place until such a time as the groundwater and sub-slab air can be evaluated after the completion of the new on-site building to determine if there are remaining concentrations of groundwater and/or soil vapor contamination that require mitigation.

The following provides a summary of the controls implemented for the Site, as well as the inspections, monitoring, maintenance, and reporting activities required by this Site Management Plan (SMP):

<b>Site Identification:</b>	C224329, 585 Union Street, Brooklyn, NY
<b>Institutional Controls:</b>	<p>Listed ICs Include:</p> <p>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);</p> <p>All ECs must be operated and maintained as specified in this SMP;</p> <p>All ECs must be inspected at a frequency and in a manner defined in this SMP;</p> <p>The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the NYC 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;</p> <p>Groundwater and other environmental or public health monitoring must be performed as defined in this SMP;</p> <p>Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP;</p> <p>All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP;</p> <p>Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP;</p> <p>Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP;</p> <p>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 Environmental Easement;</p>

	<p>The potential for vapor intrusion must be evaluated for any buildings developed in the area within the IC boundaries noted on Figure 9, and any potential impacts that are identified must be monitored or mitigated;</p> <p>Vegetable gardens and farming on the Site are prohibited; and</p> <p>An evaluation shall be performed to determine the need for further investigation and remediation should large scale redevelopment occur, if any of the existing structures are demolished, or if the subsurface is otherwise made accessible.</p> <p>ECs must be inspected at a frequency and in a manner defined in the SMP.</p>
<b>Engineering Control</b>	1. Cover system
<b>Inspections:</b>	<b>Frequency</b>
1. Cover inspection	Annually

<b>Site Identification:</b>	C224329, 585 Union Street, Brooklyn, NY
<b>Evaluations:</b>	
<p>1. Groundwater Monitoring</p> <p>2. Vapor Intrusion Evaluation</p>	<p>Annually, Should RAO Not Be Achieved</p> <p>Once during the heating season prior to building occupancy.</p>
<b>Monitoring:</b>	
1. Groundwater Monitoring Wells MW-9 and MW-10	Collection of Groundwater Samples for CP-51 Table 2 VOCs
2. Vapor Intrusion Evaluation	Collection of Soil Vapor, Indoor Air and Ambient Air Samples For TO-15 VOC Analysis
<b>Reporting:</b>	
1. Groundwater Monitoring Data	Annually Until RAO Achieved
2. Vapor Intrusion Sampling Data	Once month after the Heating Season Sampling Event
3. Periodic Review Report	First PRR will be completed 16 months after the certificate of completion (COC), then annually unless otherwise approved by the Department

Further descriptions of the above requirements are provided in detail in the latter sections of this Site Management Plan.

## **1.0 INTRODUCTION**

### **1.1 General**

This Site Management Plan (SMP) is a required element of the remedial program for the 585 Union Street site located in Brooklyn, New York (hereinafter referred to as the “Site”) until such a time as the groundwater and sub-slab air can be evaluated after the completion of the new on-site building to determine if there are remaining concentrations of groundwater and/or soil vapor contamination that require mitigation. A Site Location Map is provided as Figure 1. The Site is currently in the New York State (NYS) Brownfield Cleanup Program (BCP), which is administered by New York State Department of Environmental Conservation (NYSDEC), as Site No. C224329.

Gowanus Union Street LLC entered into a Brownfield Cleanup Agreement (BCA), Index No. C224329-09-21, on October 5, 2021 with the NYSDEC to investigate and remediate the site. A figure showing the site location and boundaries of this Site is provided in Figure 2. The boundaries of the Site are more fully described in the metes and bounds site description that is part of the Environmental Easement provided in Appendix 1.

The Site has achieved a site-specific Track 4 remedy, and, after completion of the remedial work, some contamination was left at this Site, which is hereafter referred to as “remaining contamination.” Institutional and Engineering Controls (ICs and ECs) have been incorporated into the initial site remedy to control exposure to remaining contamination to ensure protection of public health and the environment. The Site will be limited to Restricted-Residential use (subject to local zoning laws), groundwater use is prohibited, and a mechanical system designed to evacuate vapors/gases will be installed in the subgrade parking garage to control airflow between occupied spaces and the parking garage. An Environmental Easement (EE) granted to the NYSDEC and recorded with the Office of the City Register of the City of New York on November 15, 2023 (City Register File Number [CRFN]: 2023000298006) requires compliance with this SMP and all ECs and ICs placed on the Site.

This SMP was prepared to manage remaining contamination at the Site until the Environmental Easement is extinguished in accordance with ECL Article 71, Title 36. This plan has been approved by the NYSDEC, and compliance with this plan is required by the grantor of the Environmental Easement and the grantor’s successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

It is important to note that:

- This SMP details the site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the Environmental Easement, 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 No. C224329-09-21; Site No. C224329) 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. A list of contacts for persons involved with the Site is provided in Appendix 2 of this SMP.

This SMP was prepared by Impact Environmental Engineering and Geology, PLLC (IEEG), on behalf of Gowanus Union Street LLC, in accordance with the requirements of the NYSDEC's DER-10 ("Technical Guidance for Site Investigation and Remediation"), dated May 2010, and the guidelines provided by the NYSDEC. This SMP addresses the means for implementing the ICs and/or ECs that are required by the Environmental Easement for the Site.

## 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 change in media monitoring requirements, upgrades to or shutdown of a remedial system, post-remedial removal of contaminated sediment or soil, or other significant change to the site conditions. In accordance with the Environmental Easement for the Site, 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 its 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:

1. 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 Environmental Conservation Law.
2. 7-day advance notice of any field activity associated with the remedial program.
3. 15-day advance notice of any proposed ground-intrusive activity pursuant to the Excavation Work Plan. 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.
4. Notice within 48 hours of any damage or defect to the foundation, structures or EC that reduces or has the potential to reduce the effectiveness of an EC, and likewise, any action to be taken to mitigate the damage or defect.
5. Notice within 48 hours of any non-routine maintenance activities.
6. Verbal notice by noon of the following day of any emergency, such as a fire; flood; or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.
7. Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action submitted to the NYSDEC within 45 days describing and documenting actions taken to restore the effectiveness of the ECs.

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

8. At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser/Remedial Party has been provided with a copy of the Brownfield Cleanup Agreement (BCA) and all approved work plans and reports, including this SMP.
9. 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.



Table 1 below 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 2.

**Table 1: Notifications\***

<b><u>Name</u></b>	<b><u>Contact Information</u></b>	<b><u>Required Notification**</u></b>
Rafi Alam: NYSDEC Project Manager	(518) 402-8606 Rafi.Alam@dec.ny.gov	All Notifications
Heidi Dudek: NYSDEC Project Manager's Supervisor	(518) 402-0193 Heidi.Dudek@dec.ny.gov	All Notifications
Mark Sergott: NYSDOH Project Manager	(518) 402-7860 Mark.Sergott@health.ny.gov	Notifications 4, 6, and 7

\* 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 in the Gowanus neighborhood of Brooklyn, Kings County, New York and is identified as Block 433 and Lot 28 on the New York City Tax Map (see Figure 1). The Site is an approximately 0.77-acre area and is bounded by Sacket Street to the north, Union Street to the south, 3<sup>rd</sup> Avenue to the east, and numerous multi-story residential properties to the west (see Figure 3 – Site Layout Map). The boundaries of the Site are more fully described in Appendix 1 – Environmental Easement. The owner and operator of the Site parcel at the time of issuance of this SMP is Gowanus Union Street LLC.

### 2.2 Physical Setting

#### 2.2.1 Land Use

The Site will consist of a mixed use residential/commercial building with a fully built out cellar to be utilized for resident parking and minor landscaped areas situated in planters along Union Street and Sackett Street. The Site is zoned M1-4/R7A for light manufacturing and medium-density residential and located in a Coastal Zone and Federal Opportunity Zone. The Coastal Zone designation subjects the Site to the New York City Waterfront Revitalization Program (WRP). The Site is currently undergoing superstructure construction/development, and it should be noted that the sub-grade cellar foundation has been completed as of the issuance of this SMP.

The properties adjoining the Site and in the surrounding neighborhood primarily include commercial and mixed-use/residential properties. The properties immediately south of the Site include several multi-story mixed residential and commercial properties including New Body Fitness Boot CAMP/Personal Training, HIIT Box, and Green Pup. The properties immediately north of the Site include a one-story commercial warehouse occupied by A&A Brake Service and Truck Auto Parts. The properties immediately east of the Site include a one-story industrial warehouse occupied by S.J Fuel Co. The properties to the west of the Site include several multi-story residential properties.

#### 2.2.2 Geology

Site-specific geology conditions observed during the remedial investigation indicated fill material to 5 feet below grade (fbg) across most of the Site with fill material extending to 10 fbg predominantly on the

southern portion of the Site and to 15 fbg at boring locations on the east, central and south-central portions of the Site. The fill material is described as brown to dark brown medium to coarse sand with gravel, rock and anthropogenic materials consisting of concrete and brick fragments, coal, cinders, pieces of glass, tile, ceramics and/or wood. The soil identified beneath the fill material is generally described as brown-to-reddish brown and/or light grey fine-to-coarse sand with some gravel, rock fragments, silt and clay with organics in some borings to depths of 15 to 20 fbg.

The Site is proximate to the Gowanus Canal which was a tidal creek with wetlands/lowland marsh areas prior to urban development in the 1800s. The historical placement of fill materials associated with the Canal bulkhead and riprap construction, as well as the general industrialized development of the Site area, is consistent with the urban fill material observed beneath the Site. Alluvial/marsh deposits lie below the fill and are composed of alluvial sand deposits, peat, organic silts and clays (marsh deposits) which were identified in deeper portions of some on-Site soil borings. The alluvial/marsh deposits are associated with the original wetlands complex that was present when the native area was altered. This depositional environment is supported by the presence of the sand, organic material, and clay observed in deeper portions of the on-Site soil borings.

No bedrock was documented during the advancement of the previous or current borings at the Site. Damp to wet soil at the capillary fringe to the water table interface was detected at approximately 8 fbg in the Site soil borings.

A geologic cross section is shown in Figure 4. Site specific boring logs are provided in Appendix 3.

### 2.2.3 Hydrogeology

The Site is located approximately 635 feet east of the Gowanus Canal. The canal discharges to Gowanus Bay and Upper New York Bay to the southwest and is a tidally influenced channel, with a tidal cycle of two high tides and two low tides of unequal height each day, that has a vertical tidal range from approximately 4.7 to 5.7 feet. The primary aquifer beneath the Gowanus Canal and surrounding upland areas is identified as the Upper Glacial Aquifer, which is generally a thick sequence of glacial deposits that includes beds of silt, sand and clay associated with alluvial/marsh sediments along coastal areas. The Upper Glacial Aquifer beneath the Site appears to be unconfined. In the Upper Glacial Aquifer, regional groundwater flows to the

west/southwest toward the Gowanus Canal. Groundwater from the Site area is not used as a potable water supply in Brooklyn. The depth to groundwater beneath the Site on February 21, 2022 ranged from 9.09 to 13.13 feet below the well top of casing (TOC), and the elevation of the groundwater table surface across the Site ranged from 2.89 feet above mean sea level (amsl) in MW-4 to 4.78 feet amsl in MW-8. Based on the potentiometric surface map contours, groundwater flow direction is generally to the west-southwest.

A groundwater contour map is shown in Figure 5. Groundwater elevation data is provided in Table 2. Groundwater monitoring well construction logs are provided in Appendix 4.

### 2.3 Investigation and Remedial History

The Site was developed as early as 1889, when the eastern portion of the Site became occupied by a timber yard and the western portion contained a paint shop. The Site was redeveloped with the most recent warehouse structure on its eastern portion in 1938, and the Site was occupied by the NY Fire Department as an automobile repair garage and by the Telegraph Department for storage. By 1950, the eastern portion of the Site was used by the NY Fire Department Telegraph Bureau, and the western portion was identified as a machine shop. By 1970, the western portion of the Site was identified as having ‘unspecified manufacturing’ operations, and, by 1982, the South Brooklyn Casket Company occupied the entire Site. The Site was most recently occupied by Mathews International Casket Division, a casket distributor, until 2021, and the two pre-existing warehouse structures were demolished beginning on February 24, 2022. The Site is currently undergoing redevelopment.

Contamination was first identified during a Roux Environmental Engineering and Geology, D.P.C. (Roux) April 2019 Phase II ESA and an IEEG October 2020 Subsurface Investigation, when the chlorinated solvent TCE was identified in soil vapor beneath the Site, and the presence of historic fill to approximately 15 feet bgs and BTEX and petroleum constituents proximal to former gas and oil tanks were identified.

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.

April 2019 - Roux Environmental Engineering and Geology, D.P.C Phase I ESA

This Phase I ESA established a site history dating back to 1889 by review of Sanborn Maps. The Site had been a warehouse since first noted in 1938 in the historical maps with various commercial and industrial uses which included a paint shop, machine shop, and unspecified manufacturing and auto repair activities. Additionally, oil tanks at the Site were identified on the Sanborn Maps which were not identified through other means, and an abandoned gasoline tank was reported to be present below the then-existing building slab.

- The Site is listed with a Vapor Encroachment Condition (VEC);
- The Site adjoins a BCP site identified as 563 Sackett Street which has confirmed petroleum and chlorinated solvent impacts in soil vapor;
- Due to the building's date of construction (pre-1931) and materials observed during the site inspection, there is a likelihood that lead-based paint (LBP) and asbestos-containing material (ACM) were utilized in the construction of the building.

April 2019 - Roux Environmental Engineering and Geology, D.P.C Phase II ESA

A subsequent Phase II investigation was conducted by Roux on March 6, 2019. A summary of the findings of the Phase II are presented below:

The geology underlying the Site consisted of 9-to-12-feet of historic fill comprising gravel, brick and glass. Below the fill material, soil was characterized as fine-to-medium sand with clay, silt, and gravel. Groundwater was encountered at approximately 12-to-15-feet bgs, and groundwater was predicted to flow west toward the Gowanus Canal. A total of three (3) soil borings were advanced within the warehouse structure and one (1) soil sample was collected from each boring from 2-foot intervals exhibiting the greatest evidence of impact (via elevated PID detections, odors, or staining). In the absence of observable impact, soil was collected from the 2-foot interval above groundwater from soil borings RXSB-4 and RXSB-6.

o One VOC, 1,2,4-Trimethylbenzene, was detected in soil sample RXSB-5 above the NYSDEC Part 375 Restricted-Residential Soil Cleanup Objectives (RRSCOs) and Commercial Soil Cleanup Objectives (CSCOs).

O Polycyclic aromatic hydrocarbons (PAHs) were detected in all three soil samples with exceedances of RRSCOs and CSCOs identified in RXSB-5 and RXSB-6.

- o Polychlorinated biphenyls (PCBs) were not detected in any soil sample.
- o Two metals, lead and mercury, were detected in exceedance of RRSCOs in soil sample RXSB-5.
- One (1) sediment sample was collected from a floor drain located in the basement of Lot 28. PAHs and metals were detected in exceedance of RRSCOs and CSCOs in this floor drain sediment sample.
- One (1) composite soil sample was collected for waste characterization. PAHs were detected in exceedance of RRSCOs and CSCOs. TCLP metals were not detected above the USEPA regulatory levels.
- Two (2) temporary well points were installed within soil borings RXSB-5 (RXGW-2) and RXSB-6 (RXGW-3) to 20-foot and 15-foot terminal depths, respectively, each with 10-feet of 1-inch polyvinyl chloride (PVC) well screen. One (1) groundwater sample was collected from each temporary well.
  - o VOCs, PAHs, and metals (total and dissolved) were detected at concentrations exceeding their respective NYSDEC Ambient Water Quality Standards (AWQS).
  - o Petroleum-related VOCs were detected at concentrations above their respective AWQS in temporary well RXGW-2 (near of the potential location of five (5) oil tanks).
  - o Elevated metals concentrations are likely attributed to sediment in the groundwater sample and/or are naturally occurring.

One (1) soil vapor point (RXSV-2) was installed to approximately 6-inches below the building slab. Concentrations of various VOCs (PCE, 1,2,4-Trimethylbenzene, etc) were detected; however, no applicable guidance values exist in NYS for such vapor constituents. Additionally, chlorinated solvents were detected in soil vapor, and one (1) constituent, PCE, has a guidance value assigned by the NYSDOH Soil Vapor Intrusion Guidance Decision Matrices (NYSDOH Matrices); however, in review of the NYSDOH Matrices, the PCE detection does not trigger further remedial monitoring or mitigation.

October 2019 - Impact Environmental Closures, Inc. Supplemental Investigation Report

The Supplemental Investigation Report included the installation of six (6) soil borings to 15 feet bgs and the collection of twelve (12) soil samples, installation of three permanent groundwater monitoring wells to 20 feet bgs with one sample collected from each well, and installation of four (4) semi-permanent sub-slab soil vapor points with one sample collected from each point.

Findings from the soil samples

- o SVOCs, specifically PAHs, were detected at elevated concentrations exceeding their respective CSCOs in the four (4) soil samples collected from borings IEC-SB-1 and IEC-SB-2. Soil sample IECSB-3 (2'-4') contained PAH concentrations exceeding their respective RRSCOs.

- o Multiple samples had several pesticides detected at concentrations exceeding UUSCOs; the exceedances included: delta-BHC, lindane, alpha-BHC, beta-BHC, heptachlor, aldrin, endrin, dieldrin, 4,4'-DDE, 4,4'-DDD, 4,4'-DDT and cis-chlordane. Beta-BHC, Aldrin and Dieldrin exceeded RRSCOs in IECSB-6 (12'-14').

- o Several metals, including barium, copper, and mercury, were detected at concentrations exceeding RRSCOs and UUSCOs. Additionally, arsenic, lead and zinc were detected at concentrations exceeding CSCOs in the fill material identified at the Site.

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- o Several metals, including barium, copper, and mercury were detected at concentrations exceeding RRSCOs and UUSCOs. Additionally, arsenic, lead and zinc were detected at concentrations exceeding CSCOs in the fill material identified at the Site.

- o One (1) exceedance of the NYSDOH Matrices' monitoring/mitigation threshold values was detected in sub-slab soil vapor sample SV-1 for trichloroethene.

February, April, June 2022 - Impact Environmental Engineering and Geology P.LLC. Remedial Investigation Report

The RIR was conducted in February, April and June 2022 in substantial accordance with the Remedial Investigation Work Plan (RIWP) approved by NYSDEC on February 4, 2022

The remedial investigation included:



- a ground-penetrating radar (GPR) survey which identified three anomalies as potential underground storage tanks (USTs);
- the completion of 14 soil borings to further investigate areas outside of previous borings where fill material was identified and performance of field screening and laboratory analysis of a total of up to 41 samples collected at shallow intermediate and deep intervals (up to 15 feet bgs);
- Installation of five (5) soil vapor points throughout the property for the collection of five (5) soil vapor samples to further define the sub-slab and indoor air quality across the Site. Soil vapor samples were collected from approximately 6-feet bgs.
- Deployment of five (5) indoor air samples proximal to each of the soil vapor points and collection of one (1) ambient air sample.

The main contaminants of concern identified at the Site were:

1. Petroleum-related VOCs were identified in soil around SB-11 and SB-12, in groundwater around MW-1 and MW-6, and in soil vapor samples at various locations on the Site. Former USTs are identified for the area that corresponds to the referenced soil boring and groundwater samples;
2. Elevated concentrations of metals and PAHs have been consistently detected in soil and groundwater beneath the Site which is indicative of the presence of historic fill. The area comprising the Site has been filled and was historically identified as a tidal creek with wetlands/lowland marsh areas prior to urban development in the 1800s. Historic fill materials are associated with the Canal, bulkhead and riprap construction as well as the general industrialized development of the area; and
3. Emergent contaminants, perfluorooctanoic acid (PFOA) and perfluorooctane sulfuric acid (PFOS) were not detected in soil samples collected from beneath the Site; however, PFOA and PFOS were detected in the eight (8) groundwater samples collected from beneath the Site. The distribution of PFOA and PFOS at the Site indicate migration onto the Site from an off-site source.

November 2022 RAWP and NYSDEC Decision Document

In accordance with the Remedial Action Work Plan submitted to the NYSDEC on November 8, 2022 and approved on November 14, 2023, the NYSDEC issued the Decision Document for the Site on November 14, 2022, which is summarized below:

**1. Remedial Design** - The remedial design program consisted of the construction, operation, optimization, maintenance and monitoring of the remedial program. Green remediation principles and techniques were also implemented to the extent feasible per DER-31.

**2. Excavation** – All soils in the upper two feet which exceeded the Restricted-Residential soil cleanup objectives (RRSCOs) were excavated and transported off-site for disposal. In addition, petroleum source material associated with NYSDEC Spill No. 20-09932 down to approximately 10 feet below the water table, where petroleum-related VOCs exceeded protection of groundwater soil cleanup objectives (PGSCOs) and/or RRSCOs, was excavated and taken off-site for proper disposal. Collection and analysis of confirmation samples at the remedial excavation depth were used to verify that SCOs for the Site had been achieved.

**3. Backfill** - Clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) was imported to complete backfilling of the excavation and establish the designed grades at the Site.

**4. Cover System** - The existing site cover will be maintained to provide Restricted-Residential use of the Site. Any future site redevelopment will maintain the existing site cover, which consists either of the structures such as buildings, pavement, sidewalks or soil where the upper two feet of exposed surface soil meets the applicable soil cleanup objectives (SCOs) for Restricted-Residential use. Any fill material brought to the Site will meet the requirements for the identified site use as set forth in 6 NYCRR part 375-6.7(d).

**5. Groundwater Extraction & Treatment** – The proposed maximum depth of remedial excavation in the petroleum-related source area ranged between 10 to 15 feet below grade (fbg), which was below the static water table (approximately 9 to 13 fbg); therefore, dewatering to facilitate the remedial excavation and to treat petroleum VOCs in the groundwater was conducted. Extracted groundwater was treated and discharged to the local sewer system in compliance with all municipal requirements, including permits from NYCDEP and/or pretreatment if warranted.

**6. Institutional Control** - Imposition of an institutional control in the form of an environmental easement for the controlled property which will:

- 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);
- All ECs must be operated and maintained as specified in this SMP;

- All ECs must be inspected at a frequency and in a manner defined in this SMP;
- The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the NYC 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;
- Groundwater and other environmental or public health monitoring must be performed as defined in this SMP;
- Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP;
- All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP;
- Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP;
- Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed 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 Environmental Easement;
- The potential for vapor intrusion must be evaluated for any buildings developed in the area within the IC boundaries noted on Figure 9, and any potential impacts that are identified must be monitored or mitigated;
- Vegetable gardens and farming on the Site are prohibited; and
- An evaluation shall be performed to determine the need for further investigation and remediation should large scale redevelopment occur, if any of the existing structures are demolished, or if the subsurface is otherwise made accessible.

## **7. Site Management Plan**

A Site Management Plan is required, which includes the following:

a. Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the Site and details the steps and media-specific requirements necessary to ensure the following institutional and/or engineering controls remain in place and effective:

- Institutional Controls: Discussed above.
- Engineering Controls: The cover system and the Groundwater Extraction and Treatment discussed above.

This plan includes, but may not be limited to:

- an Excavation Plan which details the provisions for management of future excavations in areas of remaining contamination;
- descriptions of the provisions of the environmental easement including any land use and groundwater water use restrictions;
- a provision that should a building foundation or building slab be removed in the future, a cover system consistent with that described above will be placed in any areas where the upper two feet of exposed surface soil exceeded the applicable soil cleanup objectives (SCOs);
- for evaluation of the potential for soil vapor intrusion for any new buildings developed on the Site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion
- provisions for the management and inspection of the identified engineering controls
- maintaining site access controls and Department notification and
- the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls

b. Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to:

- monitoring of groundwater to assess the performance and effectiveness of the remedy
- a schedule of monitoring and frequency of submittals to the department and
- monitoring for vapor intrusion for any buildings on the Site, as may be required by the Institutional and Engineering Control Plan

The remedial action objectives for this Site per the Decision Document are as follows:

## 2.4 Remedial Action Objectives

The Remedial Action Objectives (RAOs) for the Site as listed in the Decision Document dated November 2022 are as follows:

### **Groundwater**

#### **RAOs for Public Health Protection**

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.  
Prevent contact with, or inhalation of, volatiles from contaminated groundwater.

#### **RAOs for Environmental Protection**

- Restore groundwater aquifer to pre-disposal/pre-release conditions, to the extent practicable.
- Remove the source of ground or surface water contamination.

### **Soil**

#### **RAOs for Public Health Protection**

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of or exposure from contaminants volatilizing from contaminants in 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

A total of approximately 14,262.42 tons of material was excavated and removed from the Site between November 30, 2022, and June 21, 2023. Approximately 12,962.24 tons of material was disposed of at Bayshore Soil Management LLC of Keasbey, NJ, 1,112.53 tons of material was disposed of at Conestoga Land Fill of Morgantown Pa and 187.65 tons of material was disposed of at Clean Earth of Kearn, NJ.

Three (3) underground storage tanks (USTs) were discovered during remedial activities and removed per the NYSDEC-approved RAWP. Tank 1 was a 5,000-gallon UST located on the northwestern portion of the Site, Tank 2 was a 1,080-gallon UST located on the southwestern portion of the Site and Tank 3 was a 5,000-gallon UST located centrally towards the southern property boundary. Three (3) bottom samples were taken from both *Tank 1* and *Tank 3* (one per five [5] linear feet) and two (2) from *Tank 2*, beneath each UST in addition to side wall samples. The samples were submitted to Alpha Analytical (Alpha) of Westborough Massachusetts an Environmental Laboratory Approval Program (ELAP)\_ Certified laboratory (Lab ID No. 10854), for analysis of CP-51 listed VOCs (EPA Method 8260C) and SVOCs (EPA Method 8270D). The results of the UST bottom samples indicated the presence of petroleum hydrocarbons associated with the USTs in the surrounding soil. The petroleum-contaminated soil beneath the USTs was further excavated and confirmation soil samples collected to document that soil met the NYSDEC Part 375 Protection of Groundwater (PGW) Soil Cleanup Objectives (SCOs) and the Track 4 Restricted-Residential (RR) SCOs. The location of the USTs and the petroleum source area are shown on **Figure 6**.

In addition to the petroleum source area excavation, four (4) hot spots were excavated to remove contaminants above the NYSDEC Part 375 PGW SCOs. Two (2) hotspots containing arsenic contamination (EP-2 and EP-22) and were excavated to between 6-8 fbg (SB-2)\_ and 15-17 fbg (SB-22) and two (2) hotspots containing PCB contamination (EP-8 and EP-30) were excavated to between 9-10 fbg (SB-30) and 15-17 fbg (EP-8)- Confirmation soil samples collected from the hot spot areas document that soil met the NYSDEC Part 375 PGW SCOs and the Track 4 RR SCOs. The location of the Hot Spots are shown on **Figure 6**.

The remaining areas of the Site were excavated to approximately 9 feet below the ground surface (bgs) and related confirmation soil samples were collected to document that soil met the NYSDEC Part 375 Track 4 RR SCOs. Refer to **Figure 6** for the confirmation soil samples collected locations.

### 2.5.2 Groundwater

Previous investigations of groundwater beneath the Site have documented concentrations of petroleum-related VOCs above the Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards (AWQS). These exceedances were primarily detected within MW-1, MW-6, MW-7, each located on the southern portion of the Site, and in MW-8, which is located in the central portion of the Site. These wells were located within the petroleum source area. The depth to groundwater beneath the Site is approximately 9 to 13 fbg, and the groundwater flow is to the west-southwest.

Monitoring wells MW-1 through MW-8 were abandoned in accordance with the NYSDEC CP-43 Groundwater Monitoring Well Decommissioning Policy prior to the start of intrusive work associated with the remedial action. A total of 219,620 gallons of groundwater was extracted, treated and the effluent discharged to the combined sewer under a NYCDEP discharge permit during the duration of dewatering activities.

New monitoring wells MW-9 and MW-10 were installed to evaluate the groundwater conditions associated with the petroleum source area. These wells were installed at a hydraulically downgradient location within the petroleum source area on the southern central portion of the Site.

On June 9, 2023, groundwater samples were collected from the newly installed monitoring wells, MW-9 and MW-10, to evaluate post-remedial action groundwater conditions. The samples were submitted to Alpha for analysis of CP-51 Table 2 List VOCs in accordance with USEPA Method 8260C. The results indicate that benzene was detected in MW-9 above the NYSDEC AWQS.

Table 3 below provides a summary of the groundwater analytical results as compared to the Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards (AWQS).

SAMPLE ID			MW-9		MW-10	
SAMPLING DATE			6/9/2023		6/9/2023	
LAB SAMPLE ID			L2332652-01		L2332652-02	
SAMPLE TYPE			WATER		WATER	
	NY-AWQS	Units	Results	Qual	Results	Qual
Benzene	1	ug/l	13		0.5	U
Toluene	5	ug/l	0.81	J	2.5	U
Ethylbenzene	5	ug/l	1.2	J	2.5	U
Methyl tert butyl ether	10	ug/l	2.5	U	2.5	U
p/m-Xylene	5	ug/l	1.8	J	2.5	U
o-Xylene	5	ug/l	0.98	J	2.5	U
n-Butylbenzene	5	ug/l	2.5	U	2.5	U
sec-Butylbenzene	5	ug/l	2.5	U	2.5	U
tert-Butylbenzene	5	ug/l	2.5	U	2.5	U
Isopropylbenzene	5	ug/l	4.6		2.5	U
p-Isopropyltoluene	5	ug/l	2.5	U	2.5	U
Naphthalene	10	ug/l	2.5	U	2.5	U
n-Propylbenzene	5	ug/l	2.9		2.5	U
1,3,5-Trimethylbenzene	5	ug/l	2.5	U	2.5	U
1,2,4-Trimethylbenzene	5	ug/l	0.78	J	2.5	U

Figure 7 shows the location of groundwater monitoring wells. The groundwater analytical results indicate the sample from MW-9 exceeded the AWQS for benzene after completion of the remedial action.

### 2.5.3 Soil Vapor

A soil vapor intrusion evaluation was completed during the Remedial Investigation. Fourteen (14) of the VOCs detected in soil vapor samples are petroleum-related and include: benzene, toluene, ethylbenzene, o-xylene and m,p-xylene (BTEX), 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, p-ethyltoluene, n-hexane, cyclohexane, n-heptane, styrene, isopropanol and propylene.

The migration of soil vapor from on-Site and potential off-site sources into the new building was mitigated by the installation of a combination of Stego Wrap® 20-mil vapor barrier beneath the building slab and Grace



PrePrufe® waterproofing membrane within the elevator pit and the exterior sidewalls along Union Street along 3<sup>rd</sup> Avenue.

The soil vapor samples collected during the remedial investigation identified the presence of petroleum-related VOCs in the samples collected. The NYSDOH and NYSDEC do not have applicable standards for petroleum-related VOCs in soil vapor, and it is anticipated that these detections of VOCs are related to the petroleum source area that was excavated and dewatered as part of the remedial action.

The table below summarize the results of RI soil vapor results prior to completion of the remedial action. Figure 8 shows the location of RI soil vapor sample points.

Sample ID	NYSDOH Matrices Indoor Air	NYSDOH Matrices Soil Vapor	SV-5		SV-6		SV-7		SV-8		SV-9	
York ID			22B1152-07		22B1152-03		22B1152-05		22B1152-09		22B1152-01	
Sampling Date			2/23/2022		2/23/2022		2/23/2022		2/23/2022		2/23/2022	
Client Matrix			Soil Vapor		Soil Vapor		Soil Vapor		Soil Vapor		Soil Vapor	
Compound			Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
<b>Volatile Organics, EPA TO15</b>	ug/m3	ug/m3	ug/m3		ug/m3		ug/m3		ug/m3		ug/m3	
<b>Dilution Factor</b>	~	~	19.64		1.479		33.4		19.03		1.714	
1,2,4-Trimethylbenzene	~	~	<b>19</b>	D	<b>27</b>	D	<b>19</b>	D	<b>19</b>	D	<b>14</b>	D
1,3,5-Trimethylbenzene	~	~	<b>5.8</b>	D	<b>11</b>	D	<b>8.2</b>	J	<b>9.4</b>	J	<b>3.9</b>	D
Benzene	~	~	<b>4.3</b>	D	<b>2.30</b>	D	<b>5.3</b>	D	<b>6.1</b>	D	<b>2.1</b>	D
Cyclohexane	~	~	<b>2.7</b>	D	<b>0.56</b>	D	5.7	U	6.6	U	<b>11</b>	D
Ethyl Benzene	~	~	<b>12</b>	D	<b>11</b>	D	<b>16</b>	D	<b>17</b>	D	<b>8.8</b>	D
Isopropanol	~	~	<b>4.1</b>	D	<b>2.6</b>	D	8.2	U	9.4	U	<b>1.5</b>	D
n-Heptane	~	~	<b>8.7</b>	D	<b>4.0</b>	D	<b>12</b>	D	<b>8.6</b>	D	<b>4.1</b>	D
n-Hexane	~	~	<b>8.9</b>	D	<b>3.6</b>	D	<b>7.1</b>	D	<b>6.7</b>	D	<b>2.1</b>	D
o-Xylene	~	~	<b>13</b>	D	<b>16</b>	D	<b>17</b>	D	<b>17</b>	D	<b>13</b>	D
p- & m- Xylenes	~	~	<b>45</b>	D	<b>53</b>	D	<b>60</b>	D	<b>64</b>	D	<b>44</b>	D
p-Ethyltoluene	~	~	<b>19</b>	D	<b>34</b>	D	<b>21</b>	D	<b>21</b>	D	<b>15</b>	D
Propylene	~	~	<b>21</b>	D	<b>4.5</b>	D	<b>13</b>	D	<b>3.3</b>	J	0.29	U
Styrene	~	~	3.3	U	<b>0.88</b>	D	7.1	U	8.1	U	<b>0.73</b>	D
Toluene	~	~	<b>1,200</b>	D	<b>54</b>	D	<b>3,300</b>	D	<b>2,100</b>	D	<b>37</b>	D
<b>NOTES:</b>												
Any Regulatory Exceedences are color coded by Regulation												
Bold - Analyte was detected												
<b>Q is the Qualifier Column with definitions as follows:</b>												
D=result is from an analysis that required a dilution												
J=analyte detected at or above the MDL (method detection limit) but below the RL (Reporting Limit) - data is estimated												
U=analyte not detected at or above the level indicated												
~=this indicates that no regulatory limit has been established for this analyte												

### 3.0 INSTITUTIONAL AND ENGINEERING CONTROL PLAN

#### 3.1 General

Because remaining contamination exists at the Site, Institutional Controls (ICs) and Engineering Controls (ECs) are required to protect human health and the environment. This IC/EC Plan describes the procedures for the implementation and management of all IC/ECs at the Site. The IC/EC Plan is one component of the SMP and is subject to revision by the NYSDEC project manager.

This plan provides:

- A description of all IC/ECs on the Site;
- The basic implementation and intended role of each IC/EC;
- 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;  
and
- Any other provisions necessary to identify or establish methods for implementing the IC/ECs 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) implement, maintain and monitor Engineering Control systems; (2) prevent future exposure to remaining contamination; and (3) limit the use and development of the Site to Restricted-Residential uses only. Adherence to these ICs on the Site is required by the Environmental Easement and will be implemented under this SMP. ICs identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement. The IC boundaries are shown on Figure 9. 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);
- All ECs must be operated and maintained as specified in this SMP;
- All ECs must be inspected at a frequency and in a manner defined in this SMP;

- The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the NYC 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;
- Groundwater and other environmental or public health monitoring must be performed as defined in this SMP;
- Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP;
- All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP;
- Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP;
- Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed 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 Environmental Easement;
- The potential for vapor intrusion must be evaluated for any buildings developed in the area within the IC boundaries noted on Figure 9, and any potential impacts that are identified must be monitored or mitigated;
- Vegetable gardens and farming on the Site are prohibited; and
- An evaluation shall be performed to determine the need for further investigation and remediation should large scale redevelopment occur, if any of the existing structures are demolished, or if the subsurface is otherwise made accessible.

### 3.3 Engineering Controls

#### 3.3.1 Cover (or Cap)

Exposure to remaining contamination at the Site is prevented by the cover system placed over the Site. This cover system is comprised of a minimum of 10-inch-thick concrete building slab that covers the entirety of the Site footprint. The concrete slab is underlain by Stego Industries Inc. 20-mil Stego Wrap® vapor barrier with the exception of the elevator pit and the exterior sidewalls along Union Street and along 3<sup>rd</sup> Avenue where Grace PrePrufe® waterproofing membrane was installed as elements of construction. Figure 10 presents the location of the cover system and applicable demarcation layers.

The Excavation Work Plan (EWP) provided in Appendix 5 outlines the procedures required to be implemented in the event the cover system is breached, penetrated or temporarily removed. Procedures for the inspection of this cover are provided in the Monitoring and Sampling Plan included in Section 4.0 of this SMP. Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in a Health and Safety Plan (HASP) and associated Community Air Monitoring Plan (CAMP) prepared for the Site and provided in Appendix 6. Any disturbance of the Site's cover system must be overseen by a qualified environmental professional as defined in 6 NYCRR Part 375, a Professional Engineer (PE) who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State.

##### 3.3.3.1 - Cover (or Cap)

The composite cover system is a permanent control and the quality and integrity of this system will be inspected at defined, regular intervals in accordance with this SMP in perpetuity.

Under no circumstances is the capping system to be disturbed or otherwise modified without the express approval of the NYSDEC. If alternation, modification or repair to the Site building requires disturbance to the onsite capping system an Excavation Work Plan (EWP) is to be developed with the QEP and operator based on the design details of the work conducted. This EWP is to be reviewed and approved by the NYSDEC prior to the commencement of work.

## **4. MONITORING AND SAMPLING PLAN**

### **4.1 General**

This Monitoring and Sampling Plan describes the measures for evaluating the overall performance and effectiveness of the remedy. This Monitoring and Sampling Plan may only be revised with the approval of the NYSDEC project manager. Details regarding the sampling procedures, data quality usability objectives, analytical methods, etc. for all samples collected as part of site management for the Site are included in the Quality Assurance Project Plan provided in Appendix 7.

This Monitoring and Sampling Plan describes the methods to be used for:

- Sampling and analysis of all appropriate media (e.g., groundwater and soil vapor intrusion sampling)
- Assessing compliance with applicable NYSDEC standards, criteria and guidance (SCGs) and
- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment;

To adequately address these issues, this Monitoring and Sampling Plan provides information on:

- Sampling locations, protocol and frequency;
- Information on all designed monitoring systems;
- Analytical sampling program requirements;
- Inspection and maintenance requirements for monitoring wells;
- Monitoring well decommissioning procedures; and
- Annual inspection and periodic certification.

Reporting requirements are provided in Section 7.0 of this SMP.

### **4.2 Site – wide Inspection**

A Site-wide inspection will be performed once per year. Site-wide inspections will be performed by a qualified environmental professional as defined in 6 NYCRR Part 375, a PE who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State. Modification to the frequency or duration of the inspections will require approval from the

NYSDEC project manager. Site-wide inspections will also be performed after all severe weather conditions that may affect ECs or monitoring devices. During these inspections, an inspection form will be completed as provided in Appendix 8 – Site Management Forms. The form will compile sufficient information to assess the following:

- Compliance with all ICs, including site usage;
- An evaluation of the condition and continued effectiveness of ECs;
- General site conditions at the time of the inspection;
- Whether stormwater management systems, such as basins and outfalls, are working as designed;
- The site management activities being conducted including, where appropriate, confirmation sampling and a health and safety inspection; and
- Confirm that site records are up to date.

Inspections of all remedial components installed at the Site will be conducted. A comprehensive site-wide inspection will be conducted and documented according to the SMP schedule, regardless of the frequency of the Periodic Review Report. The inspections will determine and document the following:

- Whether ECs continue to perform as designed;
- If these controls continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the Environmental Easement;
- Achievement of remedial performance criteria; and
- If site records are complete and up to date.

Reporting requirements are outlined in Section 7.0 of this plan.

Inspections will also be performed in the event of an emergency. If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, verbal notice to the NYSDEC project manager must be given by noon of the following day. In addition, an inspection of the Site will be conducted within 5 days of the event to verify the effectiveness of the IC/ECs implemented at the Site by a qualified environmental professional, as defined in 6 NYCCR Part 375. Written confirmation must be provided to the NYSDEC project manager within 7 days of the event that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

#### 4.4 Post-Remediation Media Monitoring and Sampling

##### 4.4.1 Soil Vapor/Indoor Air Assessment

Although not identified as an engineering control, a mechanical ventilation system designed for the sub-grade parking garage will control sub-grade airflow below the first floor/ground level occupied space. The parking garage mechanical system at the Site will evacuate vapors/gases that collect from vehicles in the garage space at 21,000 cubic feet per minute (CFM) and 5.6 air changes per hour. This mechanical ventilation system will provide an air break beneath the at-grade, street-level retail spaces, utility rooms, detention tank, rest rooms, residential tenant bike storage room, residential tenant mail and package rooms, leasing office and the residential lobby to access residential units starting on the second floor.

The Site Cap with vapor barrier performance monitoring will be accomplished by the collection of seven (7) soil vapor samples via vapor points which will be installed through the sub slab of the new building within the parking garage, prior to the building being occupied, as practicable, in conjunction with the collection of seven (7) indoor air samples as well as two (2) indoor air samples from the second floor where residential units begin, and an outdoor ambient air sample in accordance with the NYSDOH “Guidance for Evaluating Soil Vapor Intrusion in the State of New York” (October 2006) and the May 2017: Updates to Soil Vapor /Indoor Air Decision Matrices.

It should be noted that the groundwater table interface at the Site range from 9.09 to 13.13 fbg in elevation during remedial and construction activities, which is proximate to the new building subgrade slab at approximately 10 fbg. The water table elevation has the potential to interfere with soil vapor point installation and sample collection. The NYSDEC will be notified of potential changes to this performance monitoring protocol.

Soil vapor intrusion sampling needs to be performed once during the 2023-24 or 2024-25 heating season to assess the performance of the remedy.

Modification to the frequency or sampling requirements will require approval from the NYSDEC project manager.

The soil vapor/indoor air sampling event will include the following:

- Collection of seven (7) soil vapor samples from each soil vapor point to be designated as SV-10 through SV-16. One (1) duplicated sample will be collected as part of the sampling event. Vacuum measurements will also be collected at each location and recorded.
- Seven (7) indoor air samples will be collected at locations proximate (within a couple of feet) of each of the sub-slab soil vapor points.
- One (1) outdoor ambient air sample will be collected to establish background during the sampling event.
- The samples will be collected for a period of 24-hours.
- Sample analysis will be TO-15 for VOCs analysis.

The soil vapor monitoring points will be located at least 10 feet from exterior walls of the building to minimize the potential for infiltration of outdoor air into the vadose zone. The soil vapor points will initially be advanced/pre-cleared using soft dig techniques. A 6-inch long sampling implant, constructed of 3/8-inch diameter stainless steel wire wrapped screen, will then be inserted down the bore hole. The implants will be advanced down the bore hole to an anchor point. As the probe rods are removed from the bore hole, the implant and associated Teflon tubing remained firmly anchored at the bottom. A porous, inert backfill material (i.e. washed No. 2 sand) will be used to create a sampling zone of one (1) to two (2) feet in length. The soil vapor monitoring points will be sealed above the sampling zone with bentonite slurry for a minimum distance of three (3) feet to prevent outdoor air infiltration and the remainder of the borehole will be filled with concrete in conjunction with the installation of a small cast iron manhole with an access cover

Prior to sampling, the soil vapor points will be allowed to equilibrate for a minimum of 24 hours. The vapor points will then be purged of a minimum of three tube volumes of soil vapor, and the flow rates for both purging and sample collection will not exceed 0.2 liters per minute to ensure against outdoor air infiltration during sampling. The sampling flow rate will be controlled by an inlet flow regulator attached to the Summa canisters. Sampling will occur for a duration of **eight hours** and soil vapor samples will be contained in a laboratory prepared, Summa Canister which will be certified clean. The soil vapor samples will be sampled in accordance with United States Environmental Protection Agency (USEPA) Test Method TO-15 for VOCs. The integrity of the bentonite/grout seal at each soil gas sampling point will be verified using a helium tracer gas shroud test.



Indoor air quality sample locations will be collected proximal to the proposed soil vapor sample locations. Indoor Air sample acquisition will be performed utilizing 2.75-liter laboratory-supplied Summa canisters, or equivalent; each canister is to be equipped with a laboratory-prepared flow regulator set below 0.2 liters per minute per NYSDOH guidance. Each canister will be set atop an approximate three-foot tall stand, tabletop or other infrastructure. This sample collection elevation has been selected to represent air quality within typical breathing zone(s) (between three and five feet above slab grade, as specified within the NYSDOH Soil Vapor Intrusion guidance document, most recently amended in 2017).

The air samples will be analyzed in accordance with United States Environmental Protection Agency (USEPA) Test Method TO-15 for VOCs. The analytical results will be compared to the May 2017 revised decision matrices in the NYSDOH Final Guidance Document.

One (1) outdoor ambient air sample will also be collected during the soil vapor and indoor air testing and analyzed in accordance with United States Environmental Protection Agency (USEPA) Test Method TO-15 for VOCs.

#### 4.4.2 Groundwater Sampling

Additional post-remedial action low flow groundwater sample collection and analysis will be completed in August 2023 to further evaluate groundwater conditions at the Site and determine if residual groundwater concentrations are found to be below the AWQS and/or are indicating an asymptotic condition. Should the potential for an asymptotic condition be indicated, groundwater will continue to be monitored on an annual basis to assess natural attenuation to meet the NYSDEC AWQS or an acceptable level over an extended period.

Groundwater monitoring activities to assess natural attenuation will continue, as determined by the NYSDEC project manager in consultation with NYSDOH project manager, until residual groundwater concentrations are found to be consistently below AWQS or if the data indicates that monitoring for natural attenuation may no longer be required. Modification to the frequency or sampling requirements will require approval from the NYSDEC project manager.

Table 4 summarizes the well identification numbers, as well as the purpose, location, depths, diameter and screened intervals, of the wells to be sampled.

The monitoring well construction details are provided in the following table and the well locations are shown on Figure 7. Monitoring well construction logs are included in Appendix 4 of this document.

Table 4 – Monitoring Well Construction Details

Monitoring Well ID	Well Location	Coordinates (northing/easting)	Well Diameter (inches)
MW-9	Downgradient of petroleum impacted area	N:186519.048, E: 988206.437	2
MW-10	Downgradient of petroleum impacted area	N:18656.743, E: 988183.816	2

The NYSDEC project manager will be notified prior to any repair or decommissioning of any monitoring well for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent Periodic Review Report. Well decommissioning without replacement will be done only with the prior approval of the NYSDEC project manager. Well abandonment will be performed in accordance with NYSDEC’s guidance entitled “CP-43: Groundwater Monitoring Well Decommissioning Procedures.” Monitoring wells that are decommissioned because they have been rendered unusable will be replaced in kind in the nearest available location, unless otherwise approved by the NYSDEC project manager.

The sampling frequency may only be modified with the approval of the NYSDEC project manager. This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC project manager.

Table 5– Post Remediation Sampling Requirements and Schedule

Sample Locations	Groundwater Sample Analysis	Schedule
MW-9 and MW-10:	CP-51 Table 2 List VOCs	Annually

	(EPA Method 8260)	
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Deliverables for the groundwater monitoring program are specified in Section 7.0 – Reporting Requirements.

## **5.0 OPERATION AND MAINTENANCE PLAN**

### **5.1 General**

The site remedy does not rely on mechanical systems such as groundwater treatment systems, sub-slab depressurization systems or air sparge/soil vapor extraction systems to protect public health and the environment. Therefore, the operation and maintenance of such components is not included in this SMP.

## **6.0 PERIODIC ASSESSMENTS/EVALUATIONS**

### **6.1 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.

- The Site is located at an elevation of approximately 15 feet above mean sea level (amsl), and the water table is approximately 10 fbg. The Site is generally flat and slopes to the west. Surface water at the Site is directed to storm drains along Union Street, 3<sup>rd</sup> Avenue and Sacket Street. Stormwater outside the building footprint is directed to the New York City sewer system. During intense rain events, localized street flooding is possible due to the relatively low permeability of paved areas.
- The nearest surface water body is the Gowanus Canal, located approximately 635 feet west of the Site. According to the Federal Emergency Management Agency (FEMA) flood zone data, the Site is located within Flood Zone X which are defined as areas of minimal flood hazards, and an area deemed to be outside the

0.2% annual flood hazard chance floodplain and the Site is not located in the 100-year or 500-year flood zone.

## **6.2 Green Remediation Evaluation**

NYSDEC's DER-31 Green Remediation requires that green remediation concepts and techniques be considered during all stages of the remedial program including site management, with the goal of improving the sustainability of the cleanup and summarizing the net environmental benefit of any implemented green technology. This section of the SMP provides a summary of any green remediation evaluations to be completed for the Site during site management, and as reported in the Periodic Review Report (PRR).

Because no mechanical engineering control systems will be operated as part of the Site's management, the site management meets the goal of improving the sustainability of the cleanup and providing a net environmental benefit.

The Site engineering control consists of a cover system; therefore, frequent maintenance is not required.

Annual inspection will be completed with site monitoring sampling to minimize the number of visits to the Site and travel to the Site can be completed via mass transit.

The Site previously operated as a commercial facility and has been redeveloped with a energy efficient building; therefore, no effects were identified for the Site.

The Site area is highly urbanized and there are no green spaces, trees or vegetation present adjacent to the Site, therefore, there is no effect for ecosystems.

Transportation to and from the Site, use of consumables in relation to visiting the Site in order to conduct system checks and/or collect samples, and shipping samples to a laboratory for analyses have direct and/or inherent energy costs. The schedule and/or means of these periodic activities have been prepared so that these tasks can be accomplished in a manner that does not impact remedy protectiveness but reduces expenditure of energy or resources.

## 7.0. REPORTING REQUIREMENTS

### 7.1 Site Management Reports

All site management inspection, maintenance and monitoring events will be recorded on the appropriate site management forms provided in Appendix 8. These forms are subject to NYSDEC revision. All site management inspection, maintenance, and monitoring events will be conducted by a qualified environmental professional as defined in 6 NYCRR Part 375, a PE who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State.

All applicable inspection forms and other records, including media sampling data and system maintenance reports, generated for the Site during the reporting period will be provided in electronic format to the NYSDEC in accordance with the requirements of Table 5 and summarized in the Periodic Review Report.

**Table 6: Schedule of Interim Monitoring/Inspection Reports**

<b>Task/Report</b>	<b>Reporting Frequency*</b>
Inspection Report	Annually
Periodic Review Report	16 months, 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 interim monitoring/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);
- Type of samples collected (e.g., sub-slab vapor, indoor air, outdoor air);
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation);

- Sampling results in comparison to appropriate standards/criteria;
- A figure illustrating sample type and sampling locations;
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format);
- Any observations, conclusions, or recommendations; and
- A determination as to whether contaminant conditions have changed since the last reporting event.

Routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting maintenance activities;
- Description of maintenance activities performed;
- Any modifications to the system;
- 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); and
- Other documentation such as copies of invoices for maintenance work, receipts for replacement equipment, etc., (attached to the checklist/form).

Non-routine maintenance 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); and
- Other documentation such as copies of invoices for repair work, receipts for replacement equipment, etc. (attached to the checklist/form).

Data will be reported in digital format as determined by the NYSDEC. Currently, data is to be supplied electronically and submitted to the NYSDEC EQUIS™ database in accordance with the requirements found at this link <http://www.dec.ny.gov/chemical/62440.html>.

## 7.2 Periodic Review Report

A Periodic Review Report (PRR) will be submitted to the NYSDEC project manager beginning sixteen (16) months after the Certificate of Completion Letter, is issued. After submittal of the initial Periodic Review Report, the next PRR shall be submitted annually to the NYSDEC project manager or at another frequency as may be required by the NYSDEC project manager. In the event that the Site is subdivided into separate parcels with different ownership, a single Periodic Review Report will be prepared that addresses the Site described in Appendix 1 -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. Media sampling results will also be incorporated into the Periodic Review Report. The report will include:

- Identification, assessment and certification of all ECs/ICs required by the remedy for the Site.
- Results of the required annual site inspections, fire 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.
- Identification of any wastes generated during the reporting period, along with waste characterization data, manifests, and disposal documentation.
- A summary of any discharge monitoring data and/or information generated during the reporting period, with comments and conclusions.
- Data summary tables and graphical representations of contaminants of concern by media (groundwater, soil vapor, etc.), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These tables and figures will include a



presentation of past data as part of an evaluation of contaminant concentration trends, including but not limited to:

- Trend monitoring graphs that present groundwater contaminant levels from before the start of the remedy implementation to the most current sampling data;
  - Trend monitoring graphs depicting system influent analytical data on a per event and cumulative basis;
  - O&M data summary tables;
  - A current plume map for sites with remaining groundwater contamination; and
  - A groundwater elevation contour map for each gauging event.
- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted in digital format as determined by the NYSDEC. Currently, data is supplied electronically and submitted to the NYSDEC EQUIS™ database in accordance with the requirements found at this link: <http://www.dec.ny.gov/chemical/62440.html>.
  - A site evaluation, which includes the following:
    - The compliance of the remedy with the requirements of the site-specific Remedial Action Work Plan (RAWP), ROD or Decision Document;
    - The operation and the effectiveness of all treatment units, etc., including identification of any needed repairs or modifications;
    - Any new conclusions or observations regarding site contamination based on inspections or data generated by the Monitoring and Sampling Plan for the media being monitored;
    - Recommendations regarding any necessary changes to the remedy and/or Monitoring and Sampling Plan;
    - An evaluation of trends in contaminant levels in the affected media to determine if the remedy continues to be effective in achieving remedial goals as specified by the RAWP, ROD or Decision Document; and

- The overall performance and effectiveness of the remedy.

### 7.2.1 Certification of Institutional and Engineering Controls

Following the last inspection of the reporting period, a qualified environmental professional as defined in 6 NYCRR Part 375 or Professional Engineer licensed to practice and registered in New York State will prepare, and include in the Periodic Review Report, the following certification as per the requirements of NYSDEC DER-10:

*“For each institutional or engineering control identified for the Site, I certify that all of the following statements are true:*

- *The inspection of the Site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction;*
- *The institutional control and/or engineering 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;*
- *If a financial assurance mechanism is required under the oversight document for the Site, the mechanism remains valid and sufficient for the intended purpose under the document;*
- *Use of the Site is compliant with the environmental easement;*
- *The engineering control systems are performing as designed and are effective;*

- *To the best of my 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*
- *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, [name], of [business address], am certifying as [Owner/Remedial Party or Owner's/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."*

*"I certify that the New York State Education Department has granted a Certificate of Authorization to provide Professional Engineering services to the firm that prepared this Periodic Review Report."*

- *No new information has come to my attention, including groundwater monitoring data from wells located at the site boundary, if any, to indicate that the assumptions made in the qualitative exposure assessment of off-site contamination are no longer valid; and*
- *The assumptions made in the qualitative exposure assessment remain valid.*

The signed certification will be included in the Periodic Review Report.

The Periodic Review Report will be submitted, in electronic format, to the NYSDEC project manager and the NYSDOH project manager. The Periodic Review Report may also need to be submitted in hard-copy format if requested by the NYSDEC project manager.

### 7.3 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 institutional or engineering control or failure to conduct site management activities, a Corrective Measures Work Plan will be submitted to the NYSDEC project manager 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 Corrective Measures Work Plan until it has been approved by the NYSDEC project manager.

#### 7.4 Remedial Site Optimization (RSO) Report

No remedial systems are utilized as an engineering control, therefore, RSO is not applicable to the Site unless there is a change in use or future redevelopment of the Site that would require a revised conceptual site model with recommendations.

The RSO report will document the research/ investigation and data gathering that was conducted, evaluate the results and facts obtained, present a revised conceptual site model and present recommendations. RSO recommendations are to be implemented upon approval from the NYSDEC. Additional work plans, design documents, HASPs etc., may still be required to implement the recommendations, based upon the actions that need to be taken. A final engineering report and update to the SMP may also be required.

The RSO report will be submitted, in electronic format, to the NYSDEC project manager and the NYSDOH project manager.

## 8.0 REFERENCES

Roux Environmental Engineering and Geology, D.P.C Phase I ESA. April 2019.

Roux Environmental Engineering and Geology, D.P.C Phase II ESA. April 2019.

Impact Environmental Closures, Inc. Supplemental Investigation Report. October 2019.

Impact Environmental Engineering and Geology P.LLC. Remedial Investigation Report. February, April, June 2022.

NYSDEC Decision Document. November 2022.

NYSDEC, Guidance for Evaluating Soil Vapor Intrusion in the State of New York. October 2006.

NYSDEC, Updates to Soil Vapor /Indoor Air Decision Matrices. May 2017.

6 NYCRR Part 375, Environmental Remediation Programs. December 14, 2006.

NYSDEC DER-10 – “Technical Guidance for Site Investigation and Remediation”.

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).



# FIGURES

585 Union Street, Brooklyn, NY

Site Management Plan  
NYSDEC BCP #C224329



IMPACT ENVIRONMENTAL  
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 BOHEMIA, NEW YORK 11716  
 TEL (631) 269-8800 FAX (631) 269-1599  
 1000 PAGE AVENUE  
 LYNDHURST, NEW JERSEY 07071

TITLE:  
**FIGURE 1:  
 SITE LOCATION  
 MAP**

SITE:  
**577-599 UNION STREET  
 BROOKLYN NY**


SHEET NO. FIGURE 1		REVISIONS	
		NO.	DATE
PROJECT NO.	14729		
DESIGNED BY:	AB		
DRAWN BY:	AB		
CHECKED BY:	DP		
DATE:	11/20/2023		
SCALE:	NTS		

NOTES  
 1. BASE MAP TAKEN FROM NYCDCP ONLINE TOOL "ZOLA" ACCESSED 9/17/2021.





- Zoning and Land Use**
- Tax Lots
- One & Two Family Buildings
  - Multi-Family Walk-Up Buildings
  - Multi-Family Elevator Buildings
  - Mixed Residential & Commercial Buildings
  - Commercial & Office Buildings
  - Industrial & Manufacturing
  - Transportation & Utility
  - Public Facilities & Institutions
  - Open Space & Outdoor Recreation
  - Parking Facilities
  - Vacant Land
  - Other



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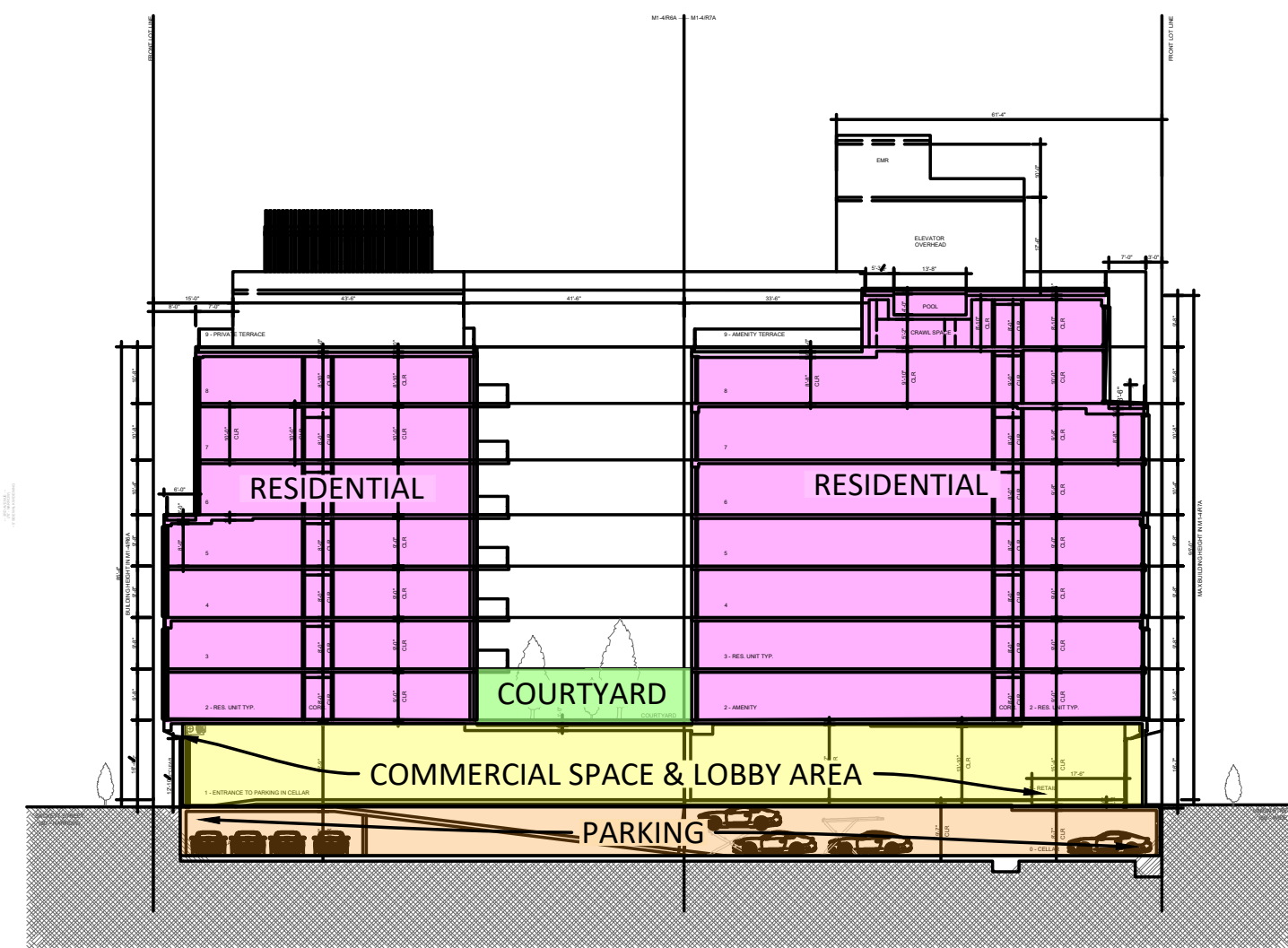
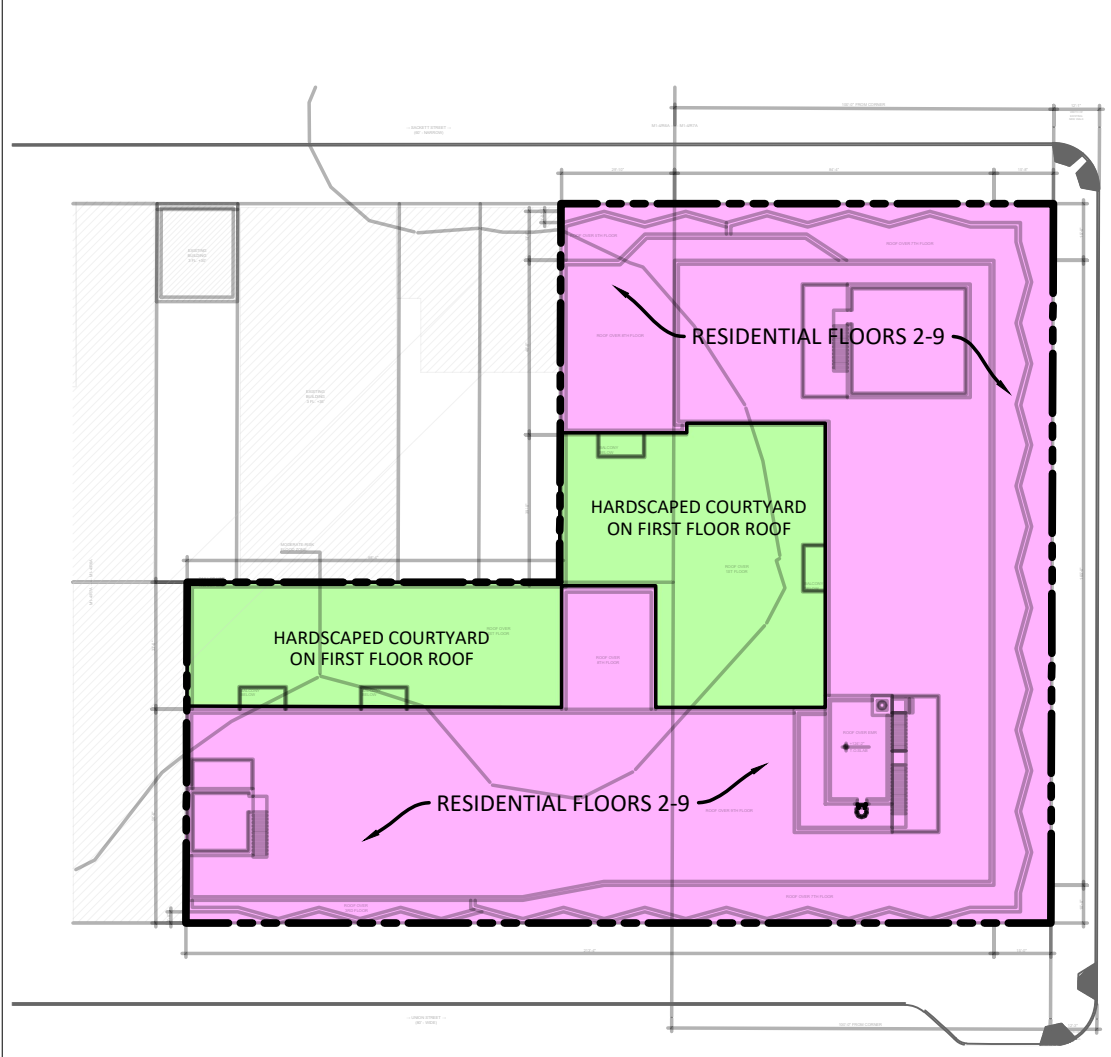
TITLE:  
  
 Site Boundary Map

SITE:  
  
 577-599 UNION STREET  
 BROOKLYN, NY

SHEET NO.		REVISIONS	
FIGURE 2		NO.	DATE
PROJECT NO.	14729		
DESIGNED BY:	AB		
DRAWN BY:	AB		
CHECKED BY:	JDF		
DATE:	6/30/2022		
SCALE:	NTS		



NOTES:  
 1. REDEVELOPMENT UNERLAYS BASED ON "ROOF BULKHEAD PLAN" DRAWING NO. A-112.00, DATED 03/22/2022 AND "BUILDING SECTIONS", DRAWING NO. A-350.00, DATED 03/22/2022.



- LEGEND
- RESIDENTIAL
  - COURTYARD
  - COMMERCIAL/LOBBY
  - PARKING


Figure 3: Site Layout

585 UNION STREET  
 BROOKLYN, NY  
 BLOCK 433, LOT 28

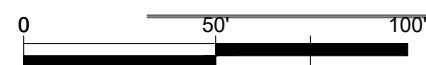
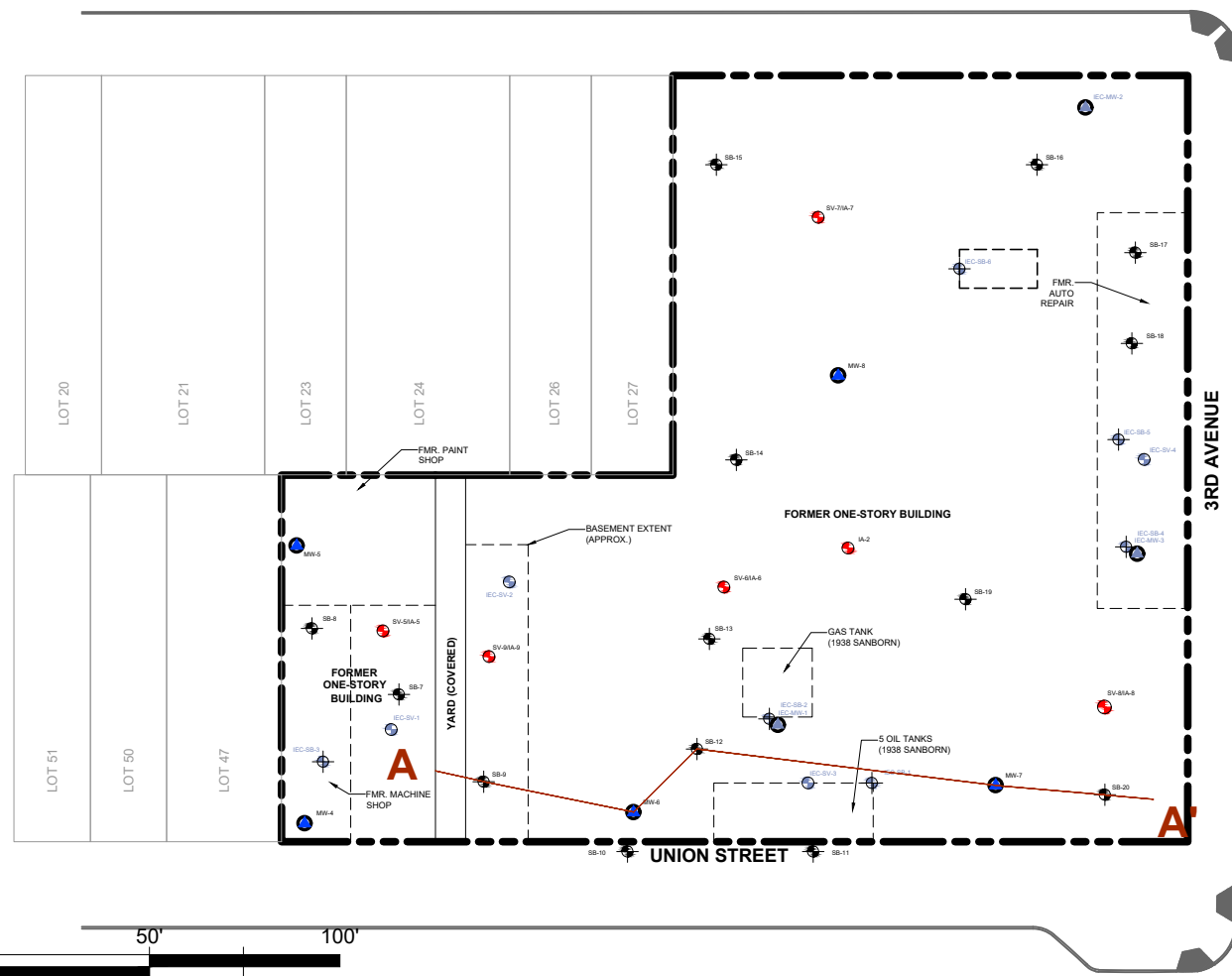
SHEET NO.  
 Figure 3





PROJECT NO.	14729
DESIGNED BY:	AB
DRAWN BY:	AB
CHECKED BY:	DP
DATE:	06/28/2022
SCALE:	N.T.S.

REVISIONS	

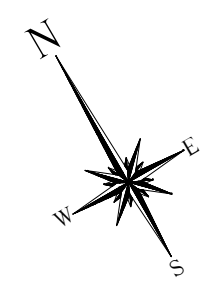


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 1000 PAGE AVENUE  
 LYNDHURST, NEW JERSEY 07071







-  FILL MATERIAL
-  RED-BROWN FINE- MEDIUM SAND
-  BROWN SAND WITH ANGULAR GRAVEL
-  BROWN SILTY SAND

- NOTES:
1. BASE MAP BOUNDARY BASED ON BORO LAND SURVEYING SURVEY, DATED 05/182019.
  2. PREVIOUS SAMPLE LOCATIONS TAKEN FROM PHASE II INVESTIGATION REPORT BY ROUX ASSOCIATES, DATED 03/28/2019.
  3. PREVIOUS SAMPLE LOCATIONS TAKEN FROM SUBSURFACE INVESTIGATION REPORT BY IEC, DATED OCTOBER 2020.



LEGEND

-  SOIL BORING
-  SOIL VAPOR POINT
-  GROUNDWATER MON. WELL
-  SEDIMENT SAMPLE

NOTE: ROUX SAMPLE POINTS HAVE BEEN SHADED GRAY, AND PREVIOUS IEC SAMPLE POINTS HAVE BEEN SHADED LIGHT BLUE.

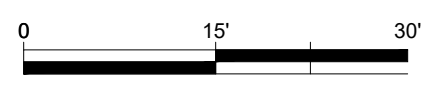
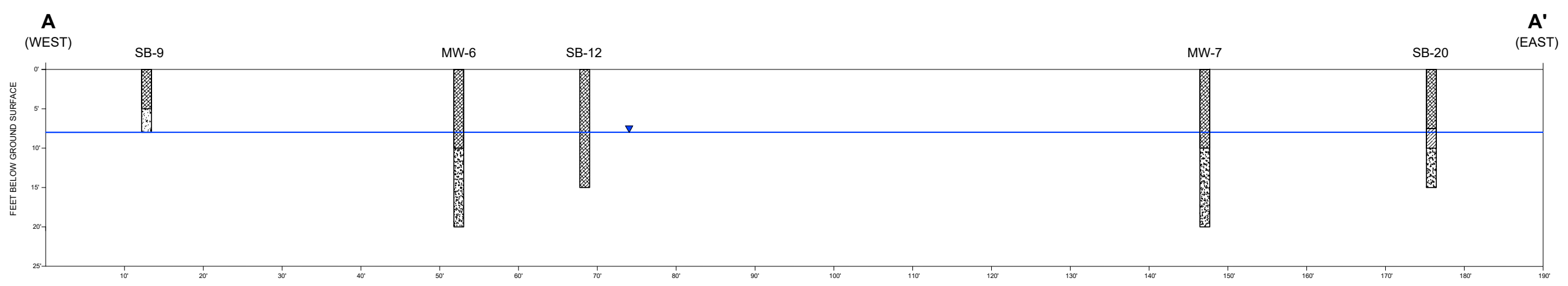



Figure 4A: Geologic Cross Section

585 UNION STREET  
BROOKLYN, NY  
BLOCK 433, LOT 28

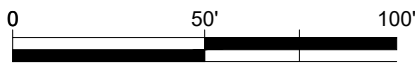
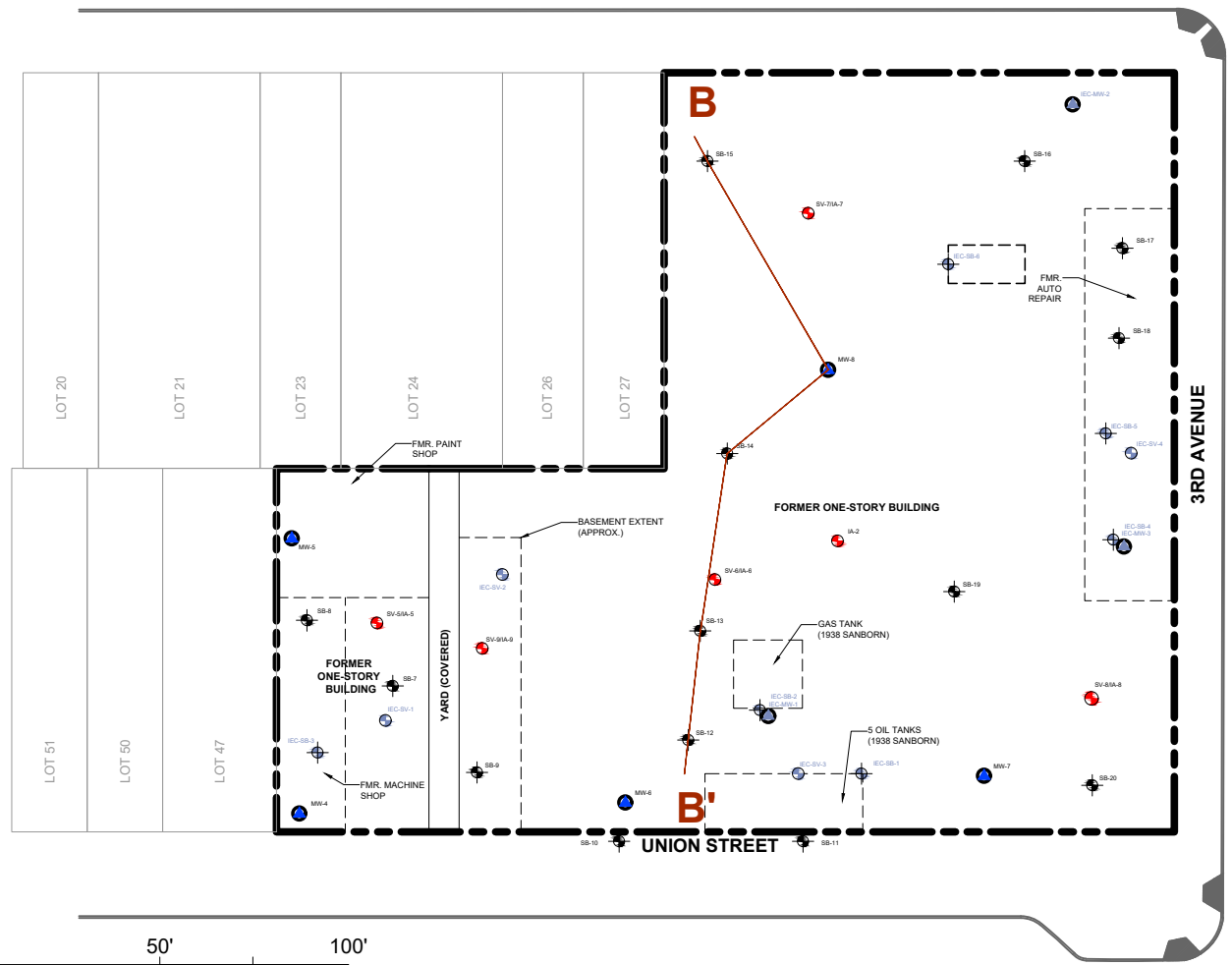
SHEET NO.  
14729\_03





PROJECT NO.	14729
DESIGNED BY:	AB
DRAWN BY:	AB
CHECKED BY:	DP
DATE:	04/07/2022
SCALE:	AS SHOWN

REVISIONS	

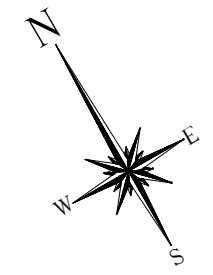


**IMPACT ENVIRONMENTAL**  
170 KEYLAND COURT  
BOHEMIA, NEW YORK 11716  
TEL (631) 269-8800 FAX (631) 269-1599  
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LYNDHURST, NEW JERSEY 07071







-  FILL MATERIAL
-  DARK GRAY MEDIUM SAND
-  BROWN SAND WITH SILT AND ANGULAR GRAVEL
-  RED-BROWN SILTY SAND

- NOTES:
1. BASE MAP BOUNDARY BASED ON BORO LAND SURVEYING SURVEY, DATED 05/18/2019.
  2. PREVIOUS SAMPLE LOCATIONS TAKEN FROM PHASE II INVESTIGATION REPORT BY ROUX ASSOCIATES, DATED 03/28/2019.
  3. PREVIOUS SAMPLE LOCATIONS TAKEN FROM SUBSURFACE INVESTIGATION REPORT BY IEC, DATED OCTOBER 2020.



LEGEND

-  SOIL BORING
-  SOIL VAPOR POINT
-  GROUNDWATER MON. WELL
-  SEDIMENT SAMPLE

NOTE: ROUX SAMPLE POINTS HAVE BEEN SHADED GRAY, AND PREVIOUS IEC SAMPLE POINTS HAVE BEEN SHADED LIGHT BLUE.

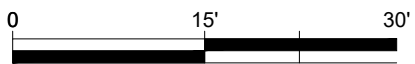
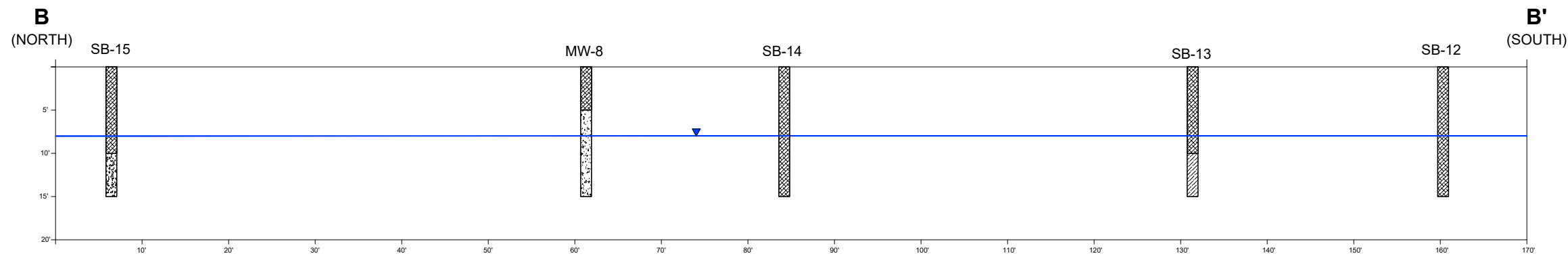



Figure 4B: Geologic Cross Section

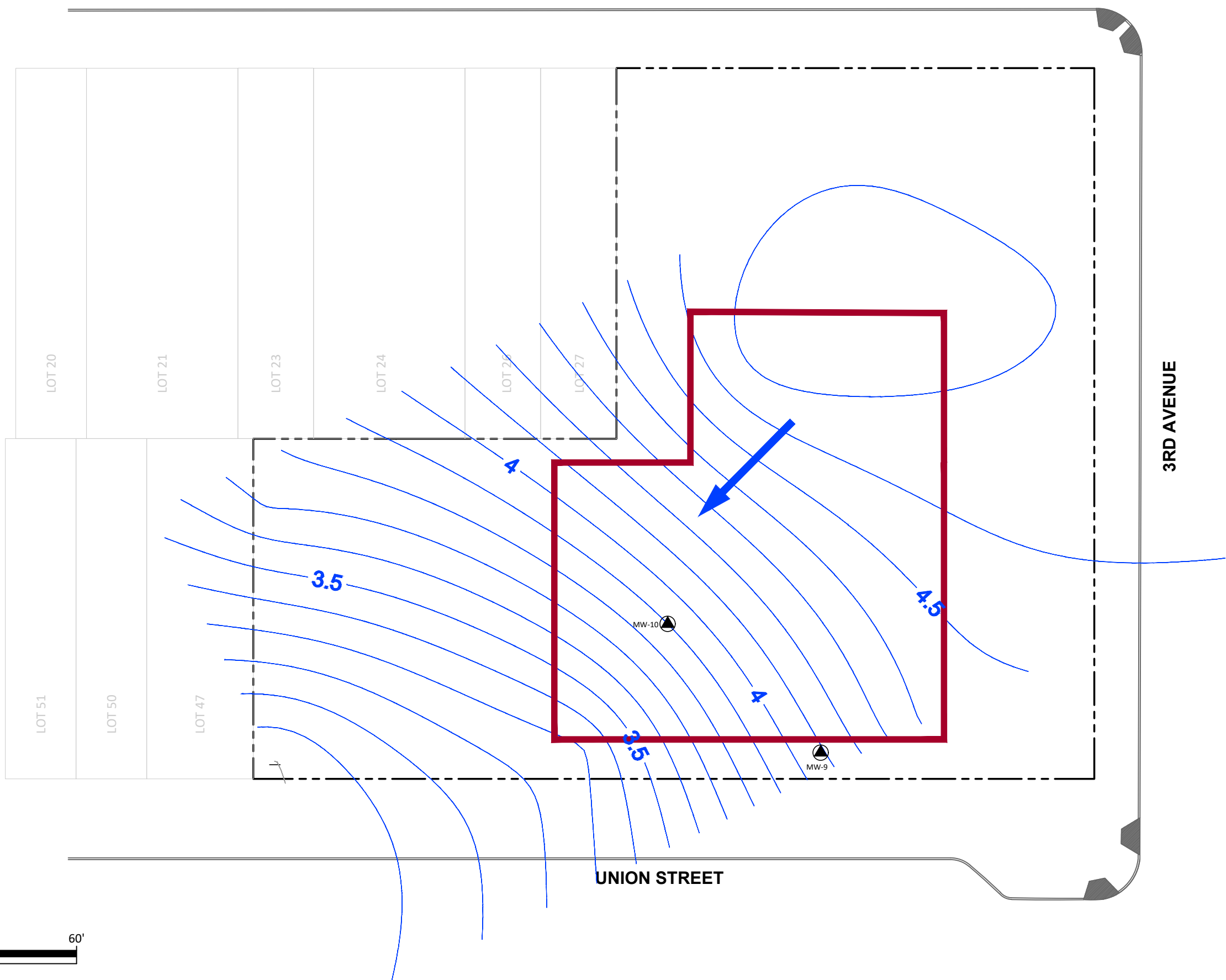
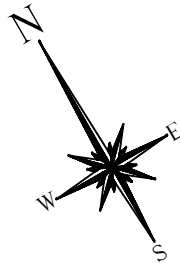
585 UNION STREET  
BROOKLYN, NY  
BLOCK 433, LOT 28

SHEET NO.	
14729_03	
PROJECT NO.	14729
DESIGNED BY:	AB
DRAWN BY:	AB
CHECKED BY:	DP
DATE:	04/07/2022
SCALE:	AS SHOWN




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NOTES:  
 1. BASE MAP BOUNDARY BASED ON BORO LAND SURVEYING SURVEY, DATED 05/18/2019.

- LEGEND:
-  MONITORING WELL
  -  PREVIOUSLY ABANDONED MONITORING WELL
  -  PETROLEUM-RELATED SOURCE AREA EXCAVATION TO 10 FBG


**FIGURE 5:  
 GROUNDWATER  
 CONTOUR MAP**

585 UNION STREET  
 BROOKLYN, NY  
 BLOCK 433, LOT 28

SHEET NO.  
 14729\_05

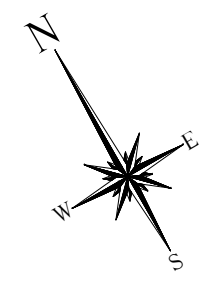
PROJECT NO.	14729
DESIGNED BY:	NS
DRAWN BY:	NS
CHECKED BY:	DP
DATE:	7/31/2023
SCALE:	1" = 30'

REVISIONS	

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 LYNDHURST, NEW JERSEY 07071

NOTES:  
 1. BASE MAP BOUNDARY BASED ON BORO LAND SURVEYING SURVEY, DATED 05/18/2019.



LEGEND

- ENDPOINT SAMPLE LOCATION
- FORMER UST LOCATION
- HOT SPOT EXCAVATION
- PETROLEUM SOURCE AREA EXCAVATION
- SITE-WIDE COVER COMPRISED OF 10-INCH THICK CONCRETE BUILDING SLAB THAT COVERS THE ENTIRETY OF THE SITE FOOTPRINT

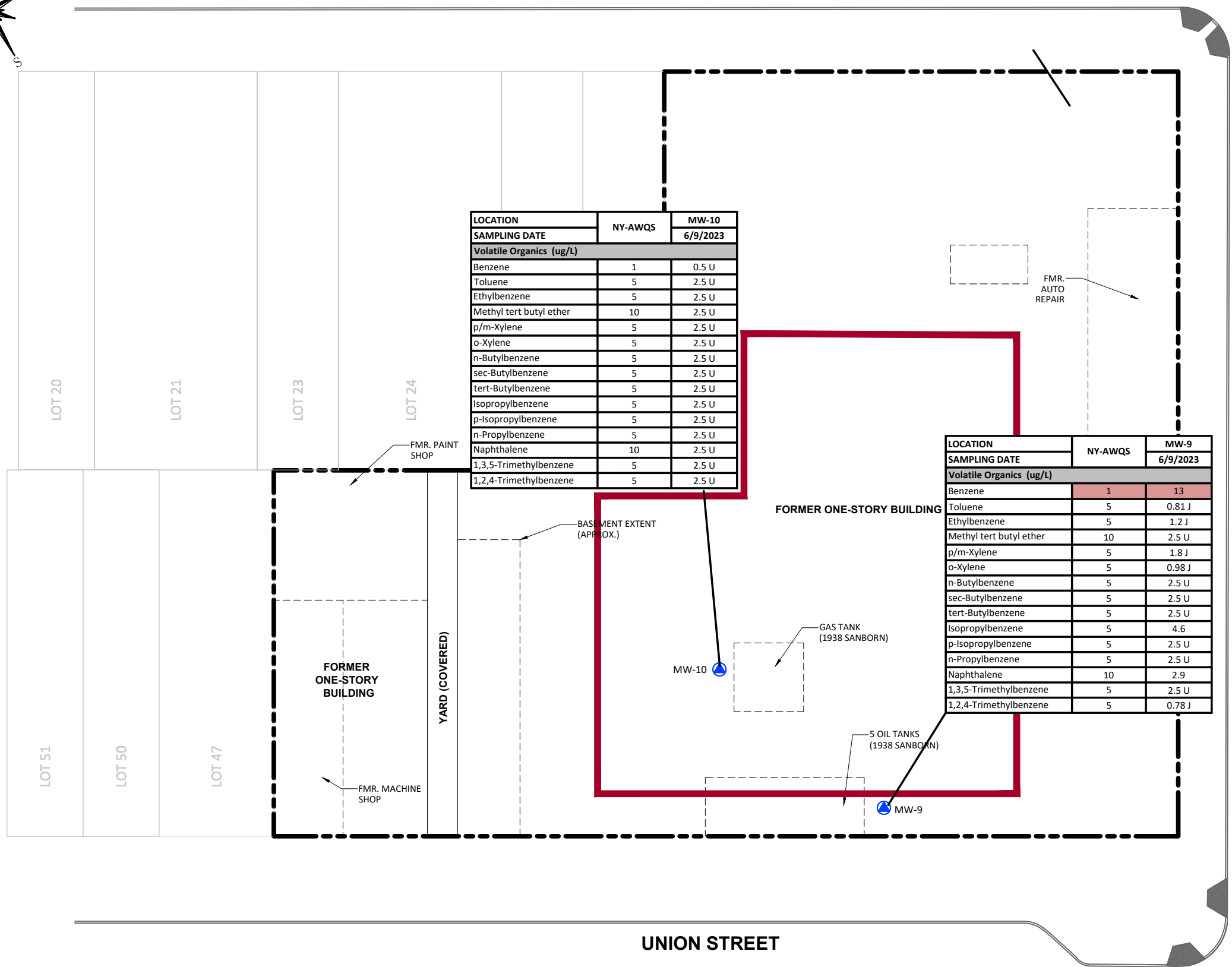
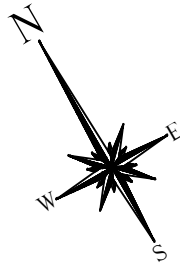
FIGURE 6: TRACK 4 REMEDIAL PLAN

585 UNION STREET  
 BROOKLYN, NY  
 BLOCK 433, LOT 28

SHEET NO.	Figure 6
PROJECT NO.	14729
DESIGNED BY:	NS
DRAWN BY:	NS
CHECKED BY:	DP
DATE:	10/3/2023
SCALE:	1" = 40'
REVISIONS	

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LOCATION	NY-AWQS	MW-10 6/9/2023
<b>Volatile Organics (ug/L)</b>		
Benzene	1	0.5 U
Toluene	5	2.5 U
Ethylbenzene	5	2.5 U
Methyl tert butyl ether	10	2.5 U
p/m-Xylene	5	2.5 U
o-Xylene	5	2.5 U
n-Butylbenzene	5	2.5 U
sec-Butylbenzene	5	2.5 U
tert-Butylbenzene	5	2.5 U
Isopropylbenzene	5	2.5 U
p-Isopropylbenzene	5	2.5 U
n-Propylbenzene	5	2.5 U
Naphthalene	10	2.5 U
1,3,5-Trimethylbenzene	5	2.5 U
1,2,4-Trimethylbenzene	5	2.5 U

LOCATION	NY-AWQS	MW-9 6/9/2023
<b>Volatile Organics (ug/L)</b>		
Benzene	1	13
Toluene	5	0.81 J
Ethylbenzene	5	1.2 J
Methyl tert butyl ether	10	2.5 U
p/m-Xylene	5	1.8 J
o-Xylene	5	0.98 J
n-Butylbenzene	5	2.5 U
sec-Butylbenzene	5	2.5 U
tert-Butylbenzene	5	2.5 U
Isopropylbenzene	5	4.6
p-Isopropylbenzene	5	2.5 U
n-Propylbenzene	5	2.5 U
Naphthalene	10	2.9
1,3,5-Trimethylbenzene	5	2.5 U
1,2,4-Trimethylbenzene	5	0.78 J

- NOTES:
1. BASE MAP BOUNDARY BASED ON BORO LAND SURVEYING SURVEY, DATED 05/182019.
  2. GROUNDWATER SAMPLE ANALYTICAL RESULTS ARE COMPARED TO THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION(NYSDEC) TECHNICAL AND OPERATIONAL GUIDANCE SERIES (TOGS) 1.1.1 AMBIENTWATER QUALITY STANDARDS (AWQS) AND GUIDANCE VALUES FOR DRINKING WATER(CLASS GA) AND TO THE NYSDEC PER-AND POLYFLUOROALKYL SUBSTANCE (PFAS) SCREENING LEVELS, JANUARY 2021.
  3. ND: NOT DETECTED
  4. NE: NO EXCEEDANCES
  5. NS: NOT SAMPLED
  6. J: ANALYTE DETECTED AT OR ABOVE THE MDL BUT BELOW THE RL.
  7. U: ANALYTE NOT DETECTED AT OR ABOVE THE LEVEL INDICATED.

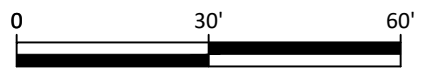
- LEGEND:
- PROPOSED MONITORING WELL
  - PETROLEUM-RELATED SOURCE AREA EXCAVATION TO 10 FBG

**FIGURE 7: GROUNDWATER MONITORING WELL LOCATIONS AND REMAINING GROUNDWATER EXCEEDANCES**

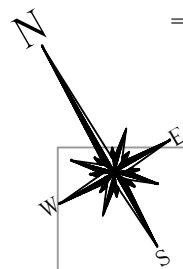
585 UNION STREET  
BROOKLYN, NY  
BLOCK 433, LOT 28

SHEET NO.  
**14729\_01**

PROJECT NO.	14729
DESIGNED BY:	NS
DRAWN BY:	NS
CHECKED BY:	DP
DATE:	7/31/2023
SCALE:	1" = 30'
REVISIONS	







NOTES:  
 1. BASE MAP BOUNDARY BASED ON CELLAR FLOOR DEVELOPMENT PLANS FROM GENERAL CONTRACTOR.

LEGEND

- PROPERTY BOUNDARY
- SOIL VAPOR POINT
- INDOOR AIR POINT
- AMBIENT AIR POINT



Figure 8: Soil Vapor Sample Locations

585 UNION STREET  
 BROOKLYN, NY  
 BLOCK 433, LOT 28

SHEET NO.  
 Figure 008

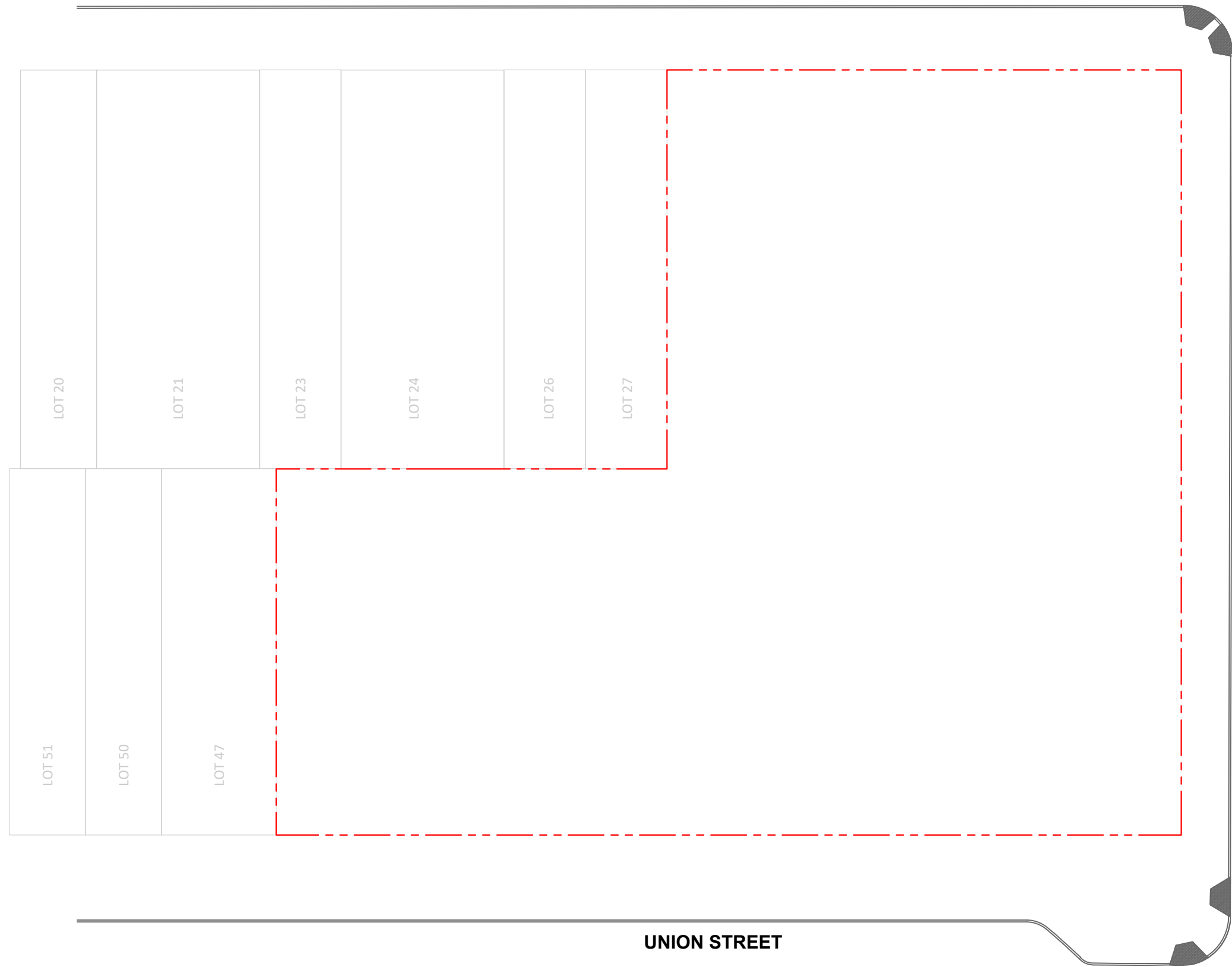
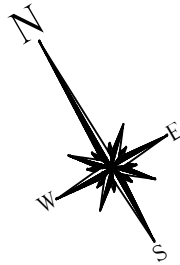
PROJECT NO.	14729
DESIGNED BY:	NS
DRAWN BY:	NS
CHECKED BY:	DP
DATE:	07/31/2023
SCALE:	1" = 25'

REVISIONS	



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NOTES:  
 1. THE SITE BOUNDARY IS ALSO THE PROPERTY BOUNDARY.

LEGEND  
 - - - - - PROPERTY BOUNDARY

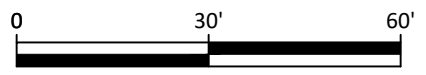
**FIGURE 9:  
 INSTITUTIONAL  
 CONTROL BOUNDARIES**

585 UNION STREET  
 BROOKLYN, NY  
 BLOCK 433, LOT 28

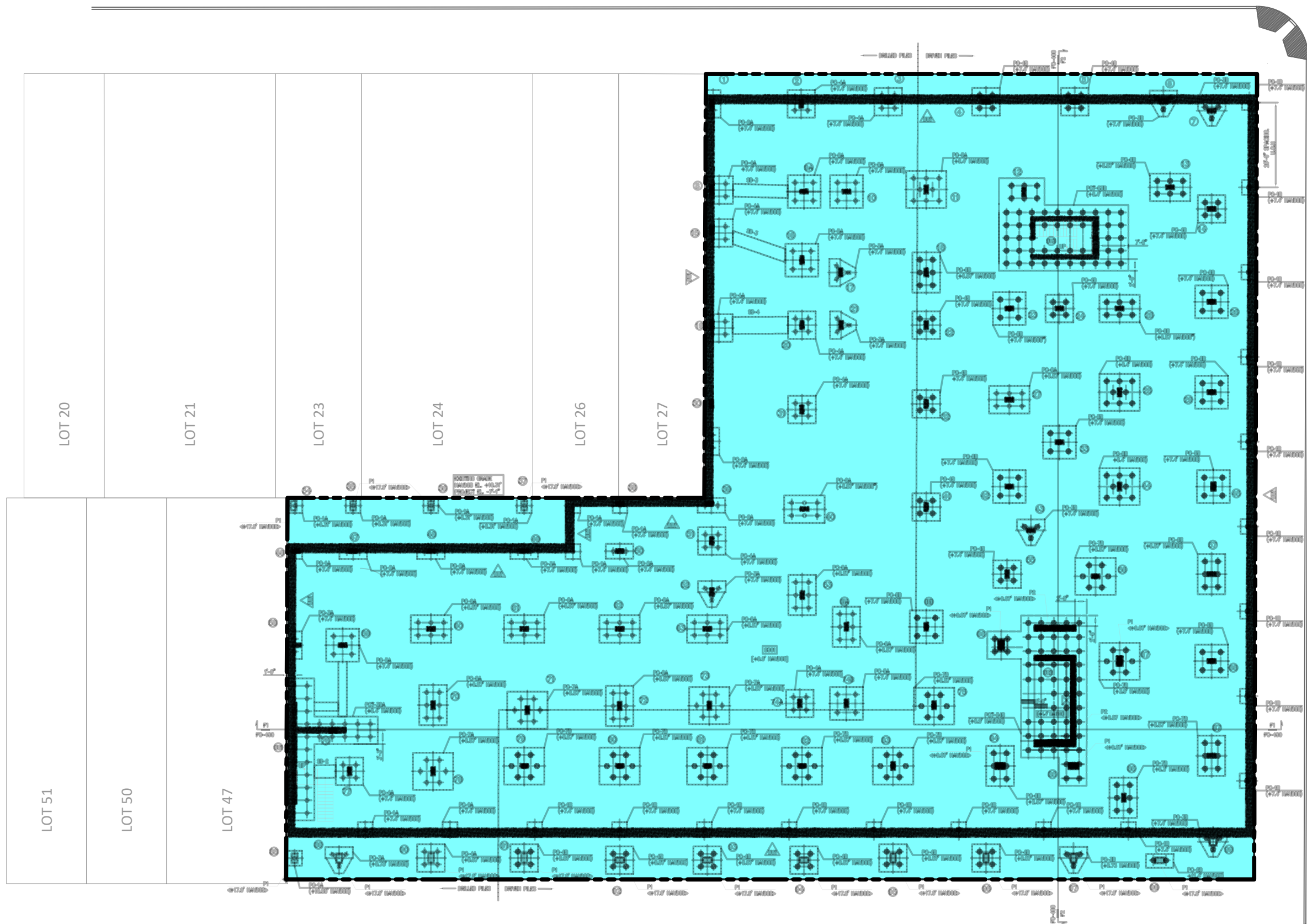
SHEET NO.  
 14729\_09

PROJECT NO.	14729
DESIGNED BY:	NS
DRAWN BY:	NS
CHECKED BY:	DP
DATE:	7/28/2023
SCALE:	1" = 30'

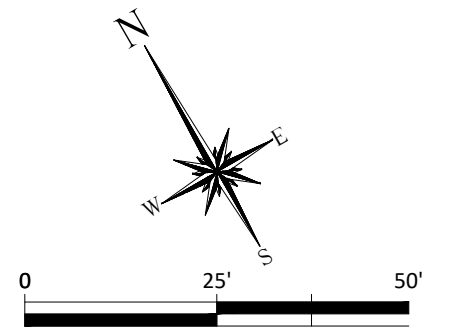
REVISIONS	



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 1000 PAGE AVENUE  
 LYNDHURST, NEW JERSEY 07071



NOTES:  
 1. FOUNDATION UNERLAY BASED ON "FOUNDATION PLAN" DRAWING NO. FO-099.00, DATED 07/30/2021, UPDATED 05/18/2022.




LEGEND  
 SITE COVER SYSTEM COMPRISED OF A MINIMUM 10-INCH THICK CONCRETE BUILDING SLAB THAT COVERS THE ENTIRETY OF THE SITE FOOTPRINT

Figure 10: Cover System Location Map

585 UNION STREET  
 BROOKLYN, NY  
 BLOCK 433, LOT 28

SHEET NO.	
Figure 10	
PROJECT NO.	14729
DESIGNED BY:	AB
DRAWN BY:	AB
CHECKED BY:	DP
DATE:	06/27/2022
SCALE:	1" = 25'
REVISIONS	

# TABLES

585 Union Street, Brooklyn, NY

Site Management Plan  
NYSDEC BCP #C224329



IMPACT ENVIRONMENTAL  
170 Keyland Court  
Bohemia, New York 11716  
TEL: (631) 268-8800  
FAX: (631) 269-1599

**Table 2- Groundwater Gauging Data**  
585 Union Street, Brooklyn, NY

<b>Well ID</b>	<b>Date Gauged</b>	<b>DTW</b>	<b>TOC Elevation</b>	<b>GW Elevation</b>
<b>MW-9</b>	<b>6/9/2023</b>	10.47	8.83	1.64
<b>MW-10</b>	<b>6/9/2023</b>	9.74	8.59	1.15

DTW = Depth to Water  
TOC = Top of Well Casing  
Wells installed by Impact

# APPENDICES

585 Union Street, Brooklyn, NY

Site Management Plan  
NYSDEC BCP #C224329



IMPACT ENVIRONMENTAL  
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Bohemia, New York 11716  
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FAX: (631) 269-1599

# Appendix 1

## Environmental Easement

Site Management Plan  
NYSDEC BCP #C224329



IMPACT ENVIRONMENTAL  
170 Keyland Court  
Bohemia, New York 11716  
TEL: (631) 268-8800  
FAX: (631) 269-1599

# SIVE | PAGET | RIESEL

**KEVIN A. ROGERS**  
DIRECT DIAL: 646.378.7275  
KROGERS@SPRLAW.COM

November 16, 2023

## **VIA FEDEX AND FTS**

Environmental Easement Attorney  
Bureau of Remediation  
Office of General Counsel, 14<sup>th</sup> Floor  
New York State Dept. of Environmental Conservation  
625 Broadway  
Albany, NY 12233-1500

Re: Brownfield Cleanup Program,  
585 Union Street, Site No. C224329  
Proofs of Recording and Mailing of Municipal Notice of  
Environmental Easement

Dear Sir or Madam,

Enclosed please find the following documents that are being submitted to the Department as proofs that the environmental easement for the above-referenced BCP Site has been recorded in the New York City Register and that the Municipal Notice of Environmental Easement has been mailed to the affected local government:

- 1) Environmental Easement for 577-599 Union Street (a/k/a 586 Sackett Street), Brooklyn, Block 433, Lot 28, dated October 20, 2023, and recorded in the Office of the City Register of the City of New York ("City Register") on November 15, 2023, as City Register File Number ("CRFN") 2023000298006;
- 2) Copy of the Municipal Notice of Environmental Easement that was sent via United States Postal Service ("USPS") certified mail, return receipt requested, to New York City Mayor Eric Adams on November 16, 2023;
- 3) Scanned copy of the USPS certified mailing slip for the Municipal Notice of Environmental Easement sent to Mayor Adams.

Electronic (PDF) copies of the enclosed documents have also been uploaded to the Department's File Transfer Service ("FTS") portal and were directed to Ms. Cheryl Salem of the Office of General Counsel ("OGC"). Additional electronic copies were directly submitted to the Project Attorney, Ms. Jennifer Andaloro, Esq., via email.

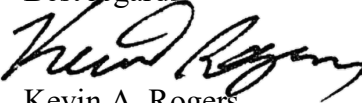
Environmental Easement Attorney

November 16, 2023

Page 2 of 2

Please do not hesitate to contact me if there are any questions or concerns. Thank you for your time and attention to this matter.

Best regards,

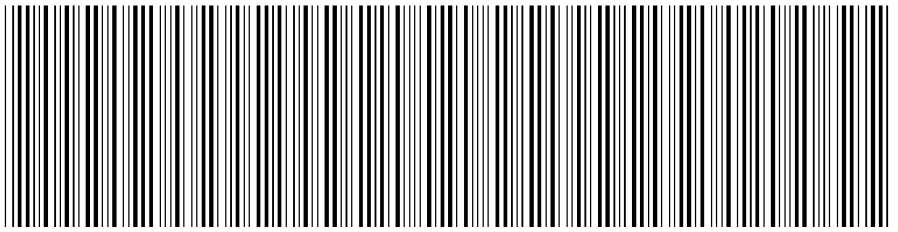


Kevin A. Rogers



**NYC DEPARTMENT OF FINANCE  
OFFICE OF THE CITY REGISTER**

This page is part of the instrument. The City Register will rely on the information provided by you on this page for purposes of indexing this instrument. The information on this page will control for indexing purposes in the event of any conflict with the rest of the document.



2023110100545001001E95F7

**RECORDING AND ENDORSEMENT COVER PAGE**

**PAGE 1 OF 10**

**Document ID: 2023110100545001**

Document Date: 10-20-2023

Preparation Date: 11-01-2023

Document Type: EASEMENT

Document Page Count: 9

**PRESENTER:**

SIVE PAGET & RIESEL, P.C.  
560 LEXINGTON AVENUE, 15TH FLOOR  
NEW YORK, NY 10022  
212-421-2150  
NDUNCAN@SPRLAW.COM

**RETURN TO:**

SIVE PAGET & RIESEL, P.C.  
560 LEXINGTON AVENUE, 15TH FLOOR  
NEW YORK, NY 10022  
212-421-2150  
NDUNCAN@SPRLAW.COM

**PROPERTY DATA**

Borough	Block	Lot	Unit	Address
BROOKLYN	433	28	Entire Lot	577-599 UNION STREET
<b>Property Type:</b> NON-RESIDENTIAL VACANT LAND Easement				

**CROSS REFERENCE DATA**

CRFN \_\_\_\_\_ or DocumentID \_\_\_\_\_ or \_\_\_\_\_ Year \_\_\_\_\_ Reel \_\_\_\_\_ Page \_\_\_\_\_ or File Number \_\_\_\_\_

**PARTIES**

**GRANTOR/SELLER:**

GOWANUS UNION STREET LLC  
C/O: TAVROS HOLDINGS LLC, 19 WEST 24TH  
STREET, 12TH FLOOR  
NEW YORK, NY 10010

**GRANTEE/BUYER:**

PEOPLE OF NEW YORK BY DEPT. ENVIRONMENTAL  
CONSERVA  
625 BROADWAY  
ALBANY, NY 12233

**FEES AND TAXES**

**Mortgage :**

Mortgage Amount: \$ 0.00

Taxable Mortgage Amount: \$ 0.00

Exemption:

TAXES: County (Basic): \$ 0.00

City (Additional): \$ 0.00

Spec (Additional): \$ 0.00

TASF: \$ 0.00

MTA: \$ 0.00

NYCTA: \$ 0.00

Additional MRT: \$ 0.00

TOTAL: \$ 0.00

Recording Fee: \$ 82.00

Affidavit Fee: \$ 0.00

**Filing Fee:**

\$ 100.00

NYC Real Property Transfer Tax:

\$ 0.00

NYS Real Estate Transfer Tax:

\$ 0.00

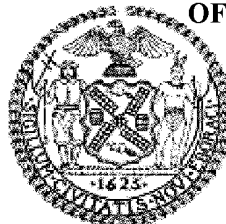
**RECORDED OR FILED IN THE OFFICE  
OF THE CITY REGISTER OF THE**

**CITY OF NEW YORK**

Recorded/Filed 11-15-2023 13:03

City Register File No.(CRFN):

2023000298006



*Colette McChia-Jacques*

**City Register Official Signature**

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

**THIS INDENTURE** made this 20th day of October, 2023, between Owner, Gowanus Union Street LLC, having an office at c/o Tavros Holdings LLC, 19 West 24th Street, 12th Floor, New York, NY 10010 (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 577-599 Union Street (a/k/a 586 Sackett Street), in the City of New York, County of Kings 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 433 Lot 28, being the same as that property conveyed to Grantor by deed dated October 17, 2019 and recorded in the City Register of the City of New York as CRFN # 2019000347062 and by deed dated October 17, 2019 and recorded in the City Register of the City of New York as CRFN #2019000347063. The property subject to this Environmental Easement (the "Controlled Property") comprises approximately .770 +/- acres, and is hereinafter more fully described in the Land Title Survey dated April 20, 2023 prepared by Vincent M. Teutonico (License No. 050307), 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 Brownfield Cleanup Agreement Index Number: C224329-09-21, 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: C224329  
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.

Gowanus Union Street LLC:

By: *Dov Barnett*

Print Name: Dov Barnett

Title: Authorized Signatory Date: 10.11.23

**Grantor's Acknowledgment**

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

On the 11<sup>TH</sup> day of OCTOBER, in the year 2023, before me, the undersigned, personally appeared DOV BARNETT, 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.

*Marina Carminati*  
Notary Public - State of New York

MARINA CARMINATI  
NOTARY PUBLIC, STATE OF NEW YORK  
Registration No. 01CA0003254  
Qualified in Queens County  
Commission Expires Mar. 21, 2027

**SEAL**



**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,

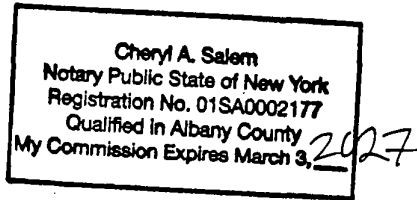
By: Andrew Guglielmi  
Andrew O. Guglielmi, Director  
Division of Environmental Remediation

**Grantee's Acknowledgment**

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

On the 20 day of October, in the year 2023 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.

Cheryl A. Salem  
Notary Public - State of New York



SEAL

**SCHEDULE "A" PROPERTY DESCRIPTION**

**BOROUGH OF KINGS, BLOCK: 433, LOT: 28 (FORMER LOTS 28 & 46)**

Environmental Easement Area:

ALL that certain lot, piece or parcel of land, situate, lying and being in the Borough of Brooklyn, County of Kings, City and State of New York, bounded and described as follows:

BEGINNING at the corner formed by the intersection of the southerly side of Sackett Street with the westerly side of 3rd Avenue;

RUNNING THENCE southerly along the westerly side of 3rd Avenue 190 feet to its intersection with the northerly side of Union Street;

THENCE westerly along the northerly side of Union Street, 228 feet 4 inches to a point;

THENCE northerly and parallel with 3rd Avenue, 90 feet to a point;

THENCE easterly and parallel with Union Street, 98 feet 4 inches to a point;

THENCE northerly and parallel with 3rd Avenue, 100 feet to the southerly side of Sackett Street;

THENCE easterly along the southerly side of Sackett Street, 130 feet to its intersection with the westerly side of 3rd Avenue, the point or place of BEGINNING.

Acreage (Environmental Easement Area): 0.770 or 33549.76 SF

# SIVE | PAGET | RIESEL

**KEVIN A. ROGERS**  
DIRECT DIAL: 646.378.7275  
KROGERS@SPRLAW.COM

November 16, 2023

## **VIA CERTIFIED MAIL**

Mayor Eric Adams  
City Hall  
New York, NY 10007

Re: Notice of Environmental Easement:  
585 Union Street, Brooklyn,  
Block 433, Lot 28  
DEC Site No. C224329

Dear Mayor Eric Adams,

Attached please find a copy of an Environmental Easement granted to the New York State Department of Environmental Conservation (“Department”) on October 20, 2023 by Gowanus Union Street LLC (“Grantor”) for property located at 577-599 Union Street (a/k/a 586 Sackett Street), Brooklyn, Block 433, Lot 28, known as DEC Site No. C224329 and by the DEC Site name, 585 Union Street.

This Environmental Easement restricts future use of the above referenced property to restricted-residential, commercial and industrial uses. Any on-site activity must be done in accordance with the Environmental Easement and Site Management Plan, which is incorporated into the Environmental Easement. Department approval is also required prior to any groundwater use. Article 71, Section 71-3607 of the New York State Environmental Conservation Law requires that:

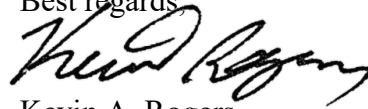
1. Whenever the Department is granted an Environmental Easement, it shall provide each affected local government with a copy of such Easement and shall also provide a copy of any documents modifying or terminating such Environmental Easement.
2. Whenever an affected local government receives an application for a building permit or any other application affecting land use or development of land that is subject to an Environmental Easement and that may relate to or impact such Easement, the affected local government shall notify the Department and refer such application to the Department. The Department shall evaluate whether the application is consistent with the Environmental Easement, and shall notify the affected local government of its determination in a timely fashion, considering the

Mayor Eric Adams  
November 15, 2023  
Page 2 of 2

time frame for the local government's review of the application. The affected local government shall not approve the application until it receives formal approval from the Department.

An electronic version of every Environmental Easement that has been accepted by the Department is available to the public at: <http://www.dec.ny.gov/chemical/36045.html>. Please forward this notice to your Building and/or Planning Departments, as applicable, to ensure your compliance with the provisions of the New York State Environmental Conservation Law. If you have any questions or comments regarding this matter, please do not hesitate to contact me.

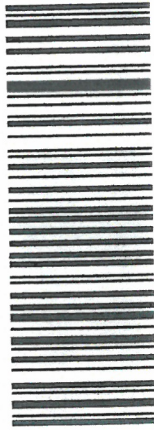
Best regards

A handwritten signature in black ink, appearing to read "Kevin Rogers", written in a cursive style.

Kevin A. Rogers

Enclosure

PLACE STICKER AT TOP OF ENVELOPE TO THE RIGHT OF THE RETURN ADDRESS. FOLD AT DOTTED LINE.  
**CERTIFIED MAIL®**



7019 1640 0001 0776 3781  
 7019 1640 0001 0776 3781

U.S. Postal Service™ <b>CERTIFIED MAIL® RECEIPT</b> Domestic Mail Only	
For delivery information, visit our website at <a href="http://www.usps.com">www.usps.com</a> ®.	
OFFICIAL USE	
Certified Mail Fee \$	Postmark Here
Extra Services & Fees (check box, add fee as appropriate)	
<input type="checkbox"/> Return Receipt (hardcopy) \$ _____ <input type="checkbox"/> Return Receipt (electronic) \$ _____ <input type="checkbox"/> Certified Mail Restricted Delivery \$ _____ <input type="checkbox"/> Adult Signature Required \$ _____ <input type="checkbox"/> Adult Signature Restricted Delivery \$ _____	
Postage \$	
Total Postage and Fees \$	
Sent To Street and Apt. No., or PO Box No. City, State, ZIP+4®	
PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions	

SENDER: COMPLETE THIS SECTION	COMPLETE THIS SECTION ON DELIVERY																
<ul style="list-style-type: none"> <li>Complete items 1, 2, and 3.</li> <li>Print your name and address on the reverse so that we can return the card to you.</li> <li>Attach this card to the back of the mailpiece, or on the front if space permits.</li> </ul>	<p>A. Signature  <b>X</b> <input type="checkbox"/> Agent  <input type="checkbox"/> Addressee</p> <p>B. Received by (Printed Name) C. Date of Delivery</p> <p>D. Is delivery address different from item 1? <input type="checkbox"/> Yes          If YES, enter delivery address below: <input type="checkbox"/> No</p>																
<p>1. Article Addressed to:</p> <p>ERIC ADAMS              CITY HALL              NEW YORK, NEW YORK, 10007</p>	<p>3. Service Type</p> <table border="0"> <tr> <td><input checked="" type="checkbox"/> Adult Signature</td> <td><input type="checkbox"/> Priority Mail Express®</td> </tr> <tr> <td><input type="checkbox"/> Adult Signature Restricted Delivery</td> <td><input type="checkbox"/> Registered Mail™</td> </tr> <tr> <td><input type="checkbox"/> Certified Mail®</td> <td><input type="checkbox"/> Registered Mail Restricted Delivery</td> </tr> <tr> <td><input type="checkbox"/> Certified Mail Restricted Delivery</td> <td><input type="checkbox"/> Signature Confirmation™</td> </tr> <tr> <td><input type="checkbox"/> Collect on Delivery</td> <td><input type="checkbox"/> Signature Confirmation Restricted Delivery</td> </tr> <tr> <td><input type="checkbox"/> Collect on Delivery Restricted Delivery</td> <td></td> </tr> <tr> <td><input type="checkbox"/> Insured Mail</td> <td></td> </tr> <tr> <td><input type="checkbox"/> Mail Restricted Delivery (0)</td> <td></td> </tr> </table>	<input checked="" type="checkbox"/> Adult Signature	<input type="checkbox"/> Priority Mail Express®	<input type="checkbox"/> Adult Signature Restricted Delivery	<input type="checkbox"/> Registered Mail™	<input type="checkbox"/> Certified Mail®	<input type="checkbox"/> Registered Mail Restricted Delivery	<input type="checkbox"/> Certified Mail Restricted Delivery	<input type="checkbox"/> Signature Confirmation™	<input type="checkbox"/> Collect on Delivery	<input type="checkbox"/> Signature Confirmation Restricted Delivery	<input type="checkbox"/> Collect on Delivery Restricted Delivery		<input type="checkbox"/> Insured Mail		<input type="checkbox"/> Mail Restricted Delivery (0)	
<input checked="" type="checkbox"/> Adult Signature	<input type="checkbox"/> Priority Mail Express®																
<input type="checkbox"/> Adult Signature Restricted Delivery	<input type="checkbox"/> Registered Mail™																
<input type="checkbox"/> Certified Mail®	<input type="checkbox"/> Registered Mail Restricted Delivery																
<input type="checkbox"/> Certified Mail Restricted Delivery	<input type="checkbox"/> Signature Confirmation™																
<input type="checkbox"/> Collect on Delivery	<input type="checkbox"/> Signature Confirmation Restricted Delivery																
<input type="checkbox"/> Collect on Delivery Restricted Delivery																	
<input type="checkbox"/> Insured Mail																	
<input type="checkbox"/> Mail Restricted Delivery (0)																	
<p>2. Article Number (Transfer from service label)</p> <p>9590 9402 6592 1028 6814 68              7019 1640 0001 0776 3781</p>																	
PS Form 3811, July 2020 PSN 7530-02-000-9053	Domestic Return Receipt																

# Appendix 2

## List of Contacts

Site Management Plan  
NYSDEC BCP #C224329



IMPACT ENVIRONMENTAL  
170 Keyland Court  
Bohemia, New York 11716  
TEL: (631) 268-8800  
FAX: (631) 269-1599

## LIST OF SITE CONTACTS

<b>Name</b>	<b>Phone/Email Address</b>
Site Owner: Gowanus Union Street LLC	(570)801-0489 <a href="mailto:pcaporaso@tavroscapital.com">pcaporaso@tavroscapital.com</a>
Qualified Environmental Professional: Kevin Kleaka	(516)805-8892 <a href="mailto:kkleaka@impactenvironmental.com">kkleaka@impactenvironmental.com</a>
Remedial Engineer: Xin Yuan	(412)719-2487 <a href="mailto:xyuan@impactenvironmental.com">xyuan@impactenvironmental.com</a>
NYSDEC DER Project Manager: Rafi Alam	(518) 402-8606 <a href="mailto:rafi.alam@dec.ny.gov">rafi.alam@dec.ny.gov</a>
NYSDEC DER Project Manager's Supervisor: Heidi Dudek	(518) 402-0193 <a href="mailto:heidi.dudek@dec.ny.gov">heidi.dudek@dec.ny.gov</a>
NYSDOH Project Manager: Mark Sergott	(518)402-7860 <a href="mailto:mark.sergott@health.ny.gov">mark.sergott@health.ny.gov</a>
Remedial Party Attorney: Michael Bogin	(646) 378-7210 <a href="mailto:mbogin@sprlaw.com">mbogin@sprlaw.com</a>

# Appendix 3

## Boring Logs


Site Management Plan  
NYSDEC BCP #C224329



IMPACT ENVIRONMENTAL  
170 Keyland Court  
Bohemia, New York 11716  
TEL: (631) 268-8800  
FAX: (631) 269-1599



## SOIL BORING LOG

 <p>Impact Environmental Closures, Inc. 170 Keyland Court Bohemia, NY 11716 P. (631) 269-8800</p>		Project #: 14729					<b>Boring ID:</b>  <b>SB-7</b>	
		Site/Project Name: 585 Union Street						
		Site Address: 585 Union Street						
		Weather:					Total Depth: 15'	
		Geologist: MD/TJ					GW: 8'	
Start Date: 2/16/22		Drilling Company: PG					GW Stabilized: N/A	
Start Time: 8:00		Driller: Orlando					GPS Coordinates:	
Completion Date: 2/16/2022		Drill Rig: Geoprobe® DT22					X: 186583.26 Y: 988116.47	
Completion Time: 15:00		Sampler Type/Len: discrete						
Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS	Soil Description	Remarks
1	0.0	SB-7 (0-2')	0-5'	Dry	48"	Fill/SP	Medium to coarse grained sand matrix with angular gravel and rock fragments, some coal, and cinder with trace brick	
2	0.0							
3	0.0							
4	0.0							
5	0.0							
6	0.0	SB-7 (6-8')	5-8'	Dry	50"	Fill/SP	Medium to coarse grained sand matrix with angular gravel and rock fragments, some coal, and cinder with trace brick	
7	0.0							
8	0.0							
9	0.0	SB-7 (10-12.5')	8-10'	Wet	46"	SP	Light grey fine to medium grained sand with some rock fragments and gravel	Odors present
10	0.0							
11	73.1							
12	0.0	SB-7 (12.5-15')	12.5-15'	Wet	46"	SM/CL	Grey to brown fine to medium grained silty sand with some clay	Odors present
13	63.2							
14	0.0							
15	34.7							


TRACE = 1 - 10%

LITTLE = 11 - 20%

SOME = 21 - 35%

AND = 36 - 50 %

## SOIL BORING LOG

 <p>Impact Environmental Closures, Inc. 170 Keyland Court Bohemia, NY 11716 P. (631) 269-8800</p>			Project #: 14729				<b>Boring ID:</b>  <b>SB-8</b>			
			Site/Project Name: 585 Union Street							
			Site Address: 585 Union Street							
			Weather:				Total Depth: 15'			
			Geologist: MD/TJ				Drilling Company: PG		GW: 8'	
Start Date: 2/17/2022			Driller: Orlando			GW Stabilized: N/A				
Start Time: 8:00			Drill Rig: Geoprobe® DT22			GPS Coordinates:				
Completion Date: 2/17/2022			Sampler Type/Len: discrete			X: 988103.87 Y: 186608.54				
Completion Time: 15:00										
Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS	Soil Description	Remarks		
1	6.2	SB-8 (0-2')	0-1'	Dry	29"	Fill/SP	Brown medium to coarse grained sand with rock fragments and trace brick			
2	0.0		1-5'				Dark brown medium to coarse grained sand with little cinder			
3	0.0									
4	0.0									
5	0.0									
6	0.7	SB-8 (6-8')	5-10'	Moist	40"	Fill/SP		Dark brown medium to coarse grained sand with some rock fragments and coal, trace cinder	Wet at 8' below grade surface.	
7	0.0									
8	0.5			Wet						
9	1.3									
10	0.0	10-15'	Wet	20"	SM	Fine to medium silty sand with some gravel, trace organics, trace rock fragments				
11	0.0									
12	0.0									
13	0.0									
14	0.0									
15	0.0	SB-8 (13-15')								


TRACE = 1 - 10%

LITTLE = 11 - 20%

SOME = 21 - 35%

AND = 36 - 50 %

## SOIL BORING LOG

 <p>Impact Environmental Closures, Inc. 170 Keyland Court Bohemia, NY 11716 P. (631) 269-8800</p>				Project #: 14729			<b>Boring ID:</b>  <b>SB-9</b>	
				Site/Project Name: 585 Union Street				
				Site Address: 585 Union Street				
				Weather:				
				Geologist: MD/TJ			Total Depth: 8'	
Start Date: 2/16/2022				Drilling Company: PG		GW: 12'		
Start Time: 8:00				Driller: Orlando		GW Stabilized: N/A		
Completion Date:				Drill Rig: Geoprobe® 420M		GPS Coordinates:		
Completion Time: 15:00				Sampler Type/Len: discrete		X: 988126.24 Y: 186553.39		
Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS	Soil Description	Remarks
1	0.0	SB-9 (0-2')	0-1.5'	Dry	27"	Fill/SP	Brown medium to coarse grained sand, some rock fragments, trace coal and cinder	
2	8.8		1.5-2.5'	Moist		SM	Brown fine to medium grained silty sand	
3	52.1	2.5-4'	SP/SM			Brown fine to medium grained sand with wood fragments, trace silt	Odor present	
4	47.2	SB-9 (6-8')	4-5.5'	Moist	48"	SP	Brown medium to coarse grained sand with angular gravel and rock fragments	Odor present
5	6.8		5.5-6.5'	Wet		SP/SM	Brown fine to medium grained sand with angular gravel, some silt, trace clay	
6	5.1	6.5-8'	SP			Brown fine to medium grained sand, wood fragments, some organics, trace clay	Odor present	
7	3.0							
8	7.2							


TRACE = 1 - 10%

LITTLE = 11 - 20%

SOME = 21 - 35%

AND = 36 - 50 %

## SOIL BORING LOG

 <p>Impact Environmental Closures, Inc. 170 Keyland Court Bohemia, NY 11716 P. (631) 269-8800</p>		Project #: 14729					<b>Boring ID:</b>  <b>SB-10</b>	
		Site/Project Name: 585 Union Street						
		Site Address: 585 Union Street						
		Weather:					Total Depth: 15'	
		Geologist: MD/TJ					GW: 8'	
Start Date: 2/18/2022		Drilling Company: PG					GW Stabilized: N/A	
Start Time: 8:00		Driller: Orlando					GPS Coordinates:	
Completion Date: 2/18/2022		Drill Rig: Geoprobe® DT22					X: 988151.63 Y: 186520.86	
Completion Time: 15:00		Sampler Type/Len: discrete						
Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS	Soil Description	Remarks
1	0.0	SB-10 (0-2')	0-5'	Dry	60"	Fill/SP	Dark brown medium to coarse grained sand with some concrete, gravel, and angular rock fragments, trace brick	
2	0.0							
3	0.0							
4	0.0							
5	0.0							
6	0.0	SB-10 (6-8')	5-10'	Moist	42"	SP	Redish brown fine to medium grained sand, trace gravel and silt	
7	0.0							
8	0.0							
9	0.0							
10	0.0							
11	0.0	SB-10 (13-15')	10-12.5'	Wet	53"	SM	Redish brown fine to medium grained silty sand with trace gravel and clay	Strong odors
12	0.0							
13	0.4							
14	0.1	SB-10 (13-15')	12.5-15'				Grey fine to medium grained silty sand with trace gravel and clay	
15	0.0							


TRACE = 1 - 10%

LITTLE = 11 - 20%

SOME = 21 - 35%

AND = 36 - 50 %

## SOIL BORING LOG

 <p>Impact Environmental Closures, Inc. 170 Keyland Court Bohemia, NY 11716 P. (631) 269-8800</p>		Project #: 14729					<b>Boring ID:</b>  <b>SB-11</b>		
		Site/Project Name: 585 Union Street							
		Site Address: 585 Union Street							
		Weather:					Total Depth: 15'		
		Geologist: MD/TJ					GW: 8'		
Start Date: 2/18/2022		Drilling Company: PG					GW Stabilized: N/A		
Start Time: 8:00		Driller: Orlando					GPS Coordinates:		
Completion Date: 2/18/2022		Drill Rig: Geoprobe® DT22					X: 988194.70 Y: 186499.72		
Completion Time: 15:00		Sampler Type/Len: discrete							
Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS	Soil Description	Remarks	
1	0.0	SB-11 (0-2')	0-5'	Dry	60"	Fill/SP	Dark brown medium to coarse grained sand with some concrete, gravel, and angular rock fragments, trace brick		
2	0.0								
3	2.1								
4	2.1								
5	6.6								
6	10.2	SB-11 (6-8')	5-10'	Moist	45"	SP	Redish brown fine to medium grained sand, trace gravel and silt		
7	17.0								
8	37.0								
9	60.0								
10	62.0	SB-11 (13-15') and (DUP) SB-23 (13-15)	10-12.5'	Wet	54"	SM	Redish brown fine to medium grained silty sand, trace gravel and clay	Strong odors	
11	1481.0								
12	1460.0								
13	7.2	12.5-15'					Grey fine to medium grained silty sand, trace gravel and clay		
14	2.0								
15	0.0								


TRACE = 1 - 10%

LITTLE = 11 - 20%

SOME = 21 - 35%

AND = 36 - 50 %

## SOIL BORING LOG

 <p>Impact Environmental Closures, Inc. 170 Keyland Court Bohemia, NY 11716 P. (631) 269-8800</p>		Project #: 14729					<b>Boring ID:</b>  <b>SB-12</b>					
		Site/Project Name: 585 Union Street										
		Site Address: 585 Union Street										
		Weather:					Total Depth: 15'					
		Geologist: MD/TJ					GW: 8'					
Start Date: 2/18/2022		Drilling Company: PG					GW Stabilized: N/A					
Start Time: 8:00		Driller: Orlando					GPS Coordinates:					
Completion Date: 2/18/2022		Drill Rig: Geoprobe® DT22					X: 988103.87 Y: 186536.70					
Completion Time: 15:00		Sampler Type/Len: discrete										
Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS	Soil Description	Remarks				
1	0.0	SB-12 (0-2')	0-1'	Dry	42"	Fill	Crushed concrete					
2	0.3		1-5'			Moist	43"		Fill	Brown to dark brown fine to medium grained sand with some angular gravel, trace brick, tile, and glass.		
3	0.2											
4	0.0											
5	0.0											
6	1.2	SB-12 (6-8')	5-8.5'	Wet	30"			Fill			Brown to dark brown fine to medium grained sand with some angular gravel and trace brick, tile, and glass	Wet at around 8'.
7	1.6											
8	0.0		8.5-10'	Wet	30"	Fill/SM	Dark brown medium to fine grain sand with trace of brick, coal, and angular gravel					
9	0.1											
10	1.0											
11	5.6	SB-12 (13-15')	10-12'					Wet	30"	Fill/SM	Dark brown to brown medium grain sand with some gravel and little angular rock, trace brick, tile, and glass	Strong Odors
12	29.1											
13	124.3		12-15'	Wet	30"	Fill/SM	Dark grey silty sand with some angular gravel, trace brick and glass					
14	674.4											
15	202.0											


TRACE = 1 - 10%

LITTLE = 11 - 20%

SOME = 21 - 35%

AND = 36 - 50 %

## SOIL BORING LOG

 <p>Impact Environmental Closures, Inc. 170 Keyland Court Bohemia, NY 11716 P. (631) 269-8800</p>		Project #: 14729					<b>Boring ID:</b>  <b>SB-13</b>				
		Site/Project Name: 585 Union Street									
		Site Address: 585 Union Street									
		Weather:					Total Depth: 15'				
		Geologist: MD/TJ					GW: 8'				
Start Date: 2/18/2022		Drilling Company: PG					GW Stabilized: N/A				
Start Time: 8:00		Driller: Orlando					GPS Coordinates:				
Completion Date: 2/18/2022		Drill Rig: Geoprobe® DT22					X: 988194.82 Y: 186560.84				
Completion Time: 15:00		Sampler Type/Len: discrete									
Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS	Soil Description	Remarks			
1	0.0	SB-13 (0-2')	0-1'	Dry	42"	Fill	Crushed rock and asphalt				
2	0.3		1-5'			Fill/SP	Brown medium to coarse grained sand with some angular rock and gravel, little coal, trace wood				
3	0.2	SB-13 (6-8')	5-10'			Moist	40"		Fill/SP	Brown medium to coarse grained sand with some angular rock and gravel, little coal, trace wood	
4	0.0										Wet
5	0.0										
6	0.0	SB-13 (13-15')		10-15'	Wet	15"		SP			Dark grey fine to medium grained sand with some gravel and rock, little silt
7	0.0										
8	0.0										
9	1.2	SB-13 (13-15')	10-15'		Wet		15"		SP	Dark grey fine to medium grained sand with some gravel and rock, little silt	
10	0.8										
11	0.0	SB-13 (13-15')		10-15'	Wet	15"		SP			Dark grey fine to medium grained sand with some gravel and rock, little silt
12	0.0										
13	1.7										
14	87.0	SB-13 (13-15')	10-15'		Wet		15"		SP	Dark grey fine to medium grained sand with some gravel and rock, little silt	
15	49.0										


TRACE = 1 - 10%

LITTLE = 11 - 20%

SOME = 21 - 35%

AND = 36 - 50 %

## SOIL BORING LOG

 <p>Impact Environmental Closures, Inc. 170 Keyland Court Bohemia, NY 11716 P. (631) 269-8800</p>		Project #: 14729					<b>Boring ID:</b>  <b>SB-14</b>	
		Site/Project Name: 585 Union Street						
		Site Address: 585 Union Street						
		Weather:					Total Depth: 15'	
		Geologist: MD/TJ					GW: 8'	
Start Date: 2/18/2022		Drilling Company: PG					GW Stabilized: N/A	
Start Time: 8:00		Driller: Orlando					GPS Coordinates:	
Completion Date: 2/18/2022		Drill Rig: Geoprobe® DT22					X: 988221.48 Y: 186599.29	
Completion Time: 15:00		Sampler Type/Len: discrete						
Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS	Soil Description	Remarks
1	0.0	SB-14 (0-2')	0-5'	Dry	34"	Fill/SM	Redish brown fine to medium grained silty sand with little gravel, trace coal, brick, cinder, ash, and concrete	
2	0.0							
3	0.0							
4	0.0							
5	0.0							
6	0.0	SB-14 (6-8') & (DUP) SB-22 (6-8')	5-10'	Moist	45"	Fill/SP	Brown fine to medium grained sand with little angular rock and gravel, trace brick, coal, and tile	Wet at 8'.
7	0.0							
8	0.0							
9	0.0							
10	0.0							
11	0.0	SB-14 (13-15')	10-15'	Wet	40"	Fill/SM	Dark grey fine to medium grained silty sand with trace rock, gravel and brick	Strong odors
12	50.3							
13	336.0							
14	190.1							
15	30.3							

TRACE = 1 - 10%


LITTLE = 11 - 20%

SOME = 21 - 35%

AND = 36 - 50 %



## SOIL BORING LOG

 <p>Impact Environmental Closures, Inc. 170 Keyland Court Bohemia, NY 11716 P. (631) 269-8800</p>		Project #: 14729					<b>Boring ID:</b>  <b>SB-15</b>	
		Site/Project Name: 585 Union Street						
		Site Address: 585 Union Street						
		Weather:					Total Depth: 15'	
		Geologist: MD/TJ					GW: 8'	
Start Date: 2/18/2022		Drilling Company: PG					GW Stabilized: N/A	
Start Time: 8:00		Driller: Orlando					GPS Coordinates:	
Completion Date: 2/18/2022		Drill Rig: Geoprobe® DT22					X: 988250.49 Y: 186670.06	
Completion Time: 15:00		Sampler Type/Len: discrete						
Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS	Soil Description	Remarks
1	0.0	SB-15 (0-2')	0-5'	Dry	34"	Fill/SP	Brown medium to coarse grained sand with crushed concrete, some rock fragments and gravel, trace coal, brick, and glass	
2	0.0							
3	0.0							
4	0.0							
5	0.0							
6	0.0	SB-15 (6-8')	5-10'	Moist	38"	Fill/SP	Brown medium to coarse grained sand with some rock fragments and gravel. Trace coal, brick, glass, cinder and wood	Wet at 8'.
7	0.0							
8	0.0							
9	0.0			Wet				
10	0.0							
11	0.0	SB-15 (13-15')	10-15'	Wet	40"	SM	Redish fine to medium grained silty sand, trace gravel, clay and rock	
12	0.0							
13	0.0							
14	0.0							
15	0.0							


TRACE = 1 - 10%

LITTLE = 11 - 20%

SOME = 21 - 35%

AND = 36 - 50 %

## SOIL BORING LOG

 <p>Impact Environmental Closures, Inc. 170 Keyland Court Bohemia, NY 11716 P. (631) 269-8800</p>			Project #: 14729				<b>Boring ID:</b>  <b>SB-16</b>			
			Site/Project Name: 585 Union Street							
			Site Address: 585 Union Street							
			Weather:				Total Depth: 15'			
			Geologist: MD/TJ				Drilling Company: PG		GW: 8'	
Start Date: 2/17/2022			Driller: Orlando			GW Stabilized: N/A				
Start Time: 8:00			Drill Rig: Geoprobe® DT22			GPS Coordinates:				
Completion Date: 2/17/2022			Sampler Type/Len: discrete			X: 988324.80 Y: 186633.57				
Completion Time: 15:00										
Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS	Soil Description	Remarks		
1	0.0	SB-16 (0-2')	0-5'	Dry	35"	Fill/SP	Dark brown medium to coarse grained sand, some brick, tile and coal, little angular rock			
2	0.0									
3	0.0									
4	0.0									
5	0.0									
6	0.0	SB-16 (0-2')	5-8'	Moist	40"	Fill/SP	Dark brown medium to coarse grained sand with some brick, tile, coal, and concrete, little angular rock	Wet at 8'.		
7	0.0									
8	0.0									
9	0.0		8-10'	Wet		SP	Dark red- brown medium to fine grained sand, trace gravel			
10	0.0									
11	0.0	SB-16 (13-15')	10-15'	Wet	25"	SM/Fill	grey fine grained silty sand with little gravel, coal, and organics, trace rubber pieces			
12	0.0									
13	0.0									
14	0.0									
15	0.0									


TRACE = 1 - 10%

LITTLE = 11 - 20%

SOME = 21 - 35%

AND = 36 - 50 %

## SOIL BORING LOG

 <p>Impact Environmental Closures, Inc. 170 Keyland Court Bohemia, NY 11716 P. (631) 269-8800</p>		Project #: 14729					<b>Boring ID:</b>  <b>SB-17</b>	
		Site/Project Name: 585 Union Street						
		Site Address: 585 Union Street						
		Weather:						
		Geologist: MD/TJ					Total Depth: 15'	
Start Date: 2/17/2022		Drilling Company: PG					GW: 18'	
Start Time: 8:00		Driller: Orlando					GW Stabilized: N/A	
Completion Date: 2/17/2022		Drill Rig: Geoprobe® DT22					GPS Coordinates:	
Completion Time: 15:00		Sampler Type/Len: discrete					X: 988337.68    Y: 186601.94	
Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS	Soil Description	Remarks
1	0.0	SB-17 (0-2') and (DUP) SB-21 (0-2')	0-4'	Dry	24"	Fill/SP	Dark brown medium to coarse grained sand with some gravel and coal, trace brick and wood chips	
2	0.7							
3	0.0							
4	1.2							
5	0.0	SB-17 (6-8')	4-6'	Moist	28"	Fill/SP	Dark brown medium to coarse grained sand with some gravel, rock, and coal, trace brick and wood chips	
6	0.0							
7	0.0	SB-17 (6-8')	6-8'			SP	Dark brown fine to medium grained sand, trace gravel	
8	0.0							
9	0.0	SB-17 (13-15')	8-12'	Wet	32"	SM	Brown fine to medium grained sand, trace gravel	Wet at 8' below grade surface
10	0.0							
11	0.0							
12	0.0							
13	0.0	SB-17 (13-15')	12-15'	Wet	32"	SM	Brown fine grained silty sand, trace clay trace gravel	
14	0.0							
15	0.0							


TRACE = 1 - 10%

LITTLE = 11 - 20%

SOME = 21 - 35%

AND = 36 - 50 %

## SOIL BORING LOG

 <p>Impact Environmental Closures, Inc. 170 Keyland Court Bohemia, NY 11716 P. (631) 269-8800</p>		Project #: 14729					<b>Boring ID:</b>  <b>SB-18</b>	
		Site/Project Name: 585 Union Street						
		Site Address: 585 Union Street						
		Weather:					Total Depth: 15'	
		Geologist: MD/TJ					GW: 8'	
Start Date: 2/17/2022		Drilling Company: PG					GW Stabilized: N/A	
Start Time: 8:00		Driller: Orlando					GPS Coordinates:	
Completion Date: 2/17/2022		Drill Rig: Geoprobe® DT22					X: 988326.54 Y: 186581.31	
Completion Time: 15:00		Sampler Type/Len: discrete						
Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS	Soil Description	Remarks
1	0.0	SB-18 (0-2')	0-5'	Dry	28"	Fill/SP	Dark brown medium to coarse grained sand with angular gravel, some coal and cinder, trace brick	
2	0.0							
3	0.0							
4	0.0							
5	0.0							
6	0.0	SB-18 (6-8')	5-6.5'	Moist	24"	Fill/SP	Dark brown medium to coarse grained sand with angular gravel with some some coal and cinder, trace of brick	Wet at 8' below grade surface.
7	0.0							
8	0.0	6.5-10'		Wet	SM	Red-brown fine to medium grained silty sand, some gravel		
9	0.0							
10	0.0							
11	0.0	SB-18 (13-15')	10-15'	Moist	30"	SM	Dark brown medium to coarse grain sand with angular fragmented rocks, some coal and cinder, trace brick	
12	0.0							
13	0.0							
14	0.0							
15	0.0							


TRACE = 1 - 10%

LITTLE = 11 - 20%

SOME = 21 - 35%

AND = 36 - 50 %

## SOIL BORING LOG

 <p>Impact Environmental Closures, Inc. 170 Keyland Court Bohemia, NY 11716 P. (631) 269-8800</p>		Project #: 14729					<b>Boring ID:</b>  <b>SB-19</b>	
		Site/Project Name: 585 Union Street						
		Site Address: 585 Union Street						
		Weather:					Total Depth: 15'	
		Geologist: MD/TJ					GW: 18'	
Start Date: 2/18/2022		Drilling Company: PG					GW Stabilized: N/A	
Start Time: 8:00		Driller: Orlando					GPS Coordinates:	
Completion Date: 2/18/2022		Drill Rig: Geoprobe® DT22					X: 988258.78 Y: 186540.86	
Completion Time: 15:00		Sampler Type/Len: discrete						
Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS	Soil Description	Remarks
1	0.0	SB-19 (0-2')	0-1'	Dry	30"	Fill	Concrete	
2	0.0					1-5'	Fill/SP	
3	0.0							
4	0.0							
5	0.0		5-10'			Moist	32"	
6	0.0	SB-19 (6-8')						
7	0.0				Wet			
8	0.0							
9	0.0		10-15'	Wet	20"	SP	Medium to coarse grained sand with some gravel	Strong odors
10	0.0							
11	0.0							
12	0.0							
13	0.0	SB-19 (13-15')						
14	47.3							
15	0.0							


TRACE = 1 - 10%

LITTLE = 11 - 20%

SOME = 21 - 35%

AND = 36 - 50 %

## SOIL BORING LOG

 <p>Impact Environmental Closures, Inc. 170 Keyland Court Bohemia, NY 11716 P. (631) 269-8800</p>		Project #: 14729					<b>Boring ID:</b>  <b>SB-20</b>			
		Site/Project Name: 585 Union Street								
		Site Address: 585 Union Street								
		Weather:					Total Depth: 15'			
		Geologist: MD/TJ					GW: 8'			
Start Date: 2/17/2022		Drilling Company: PG					GW Stabilized: N/A			
Start Time: 8:00		Driller: Orlando					GPS Coordinates:			
Completion Date: 2/17/2022		Drill Rig: Geoprobe® 420M					X: 988268.84 Y: 186479.64			
Completion Time: 15:00		Sampler Type/Len: discrete								
Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS	Soil Description	Remarks		
1	0.0	SB-20 (0-2")	0-5'	Dry	36"	Fill/SP	Brown medium to coarse grained sand with angular gravel, little crushed cinder and coal, trace brick			
2	0.0									
3	0.0									
4	0.0									
5	0.0									
6	0.0		5-6.5'	Moist	36"	Fill/SP	Brown medium to coarse grained sand with angular gravel, little cinder and coal, trace brick	Wet at 8' below grade surface. Slight odor, No PID		
7	0.0	SB-20 (6-8")	6.5-8'						SP	Redish brown fine to medium grained sand with little angular gravel
8	0.0									
9	0.0		8-10'	Wet	SM	Redish brown fine to medium grained silty sand, little angular gravel, trace clay				
10	0.0		10-15'	Wet	36"	SM	Brown fine to medium grained silty sand, trace clay			
11	0.0									
12	0.0									
13	0.0									
14	0.0	SB-20 (13-15')								
15	0.0									

TRACE = 1 - 10%

LITTLE = 11 - 20%

SOME = 21 - 35%

AND = 36 - 50 %

# Appendix 4

## Groundwater Well Construction Logs

Site Management Plan  
NYSDEC BCP #C224329



IMPACT ENVIRONMENTAL  
170 Keyland Court  
Bohemia, New York 11716  
TEL: (631) 268-8800  
FAX: (631) 269-1599



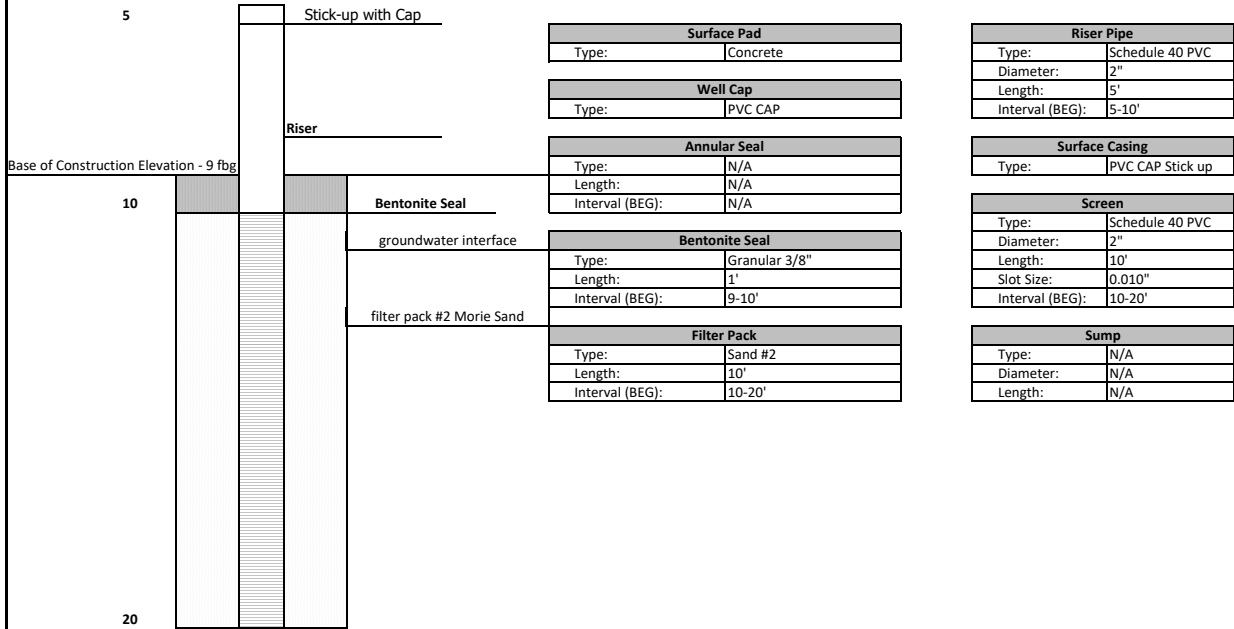
IMPACT ENVIRONMENTAL  
 170 Keyland Court, Bohemia, New York 11716  
 631.269.8800 telephone | 631.269.1599 facsimile  
 impactenvironmental.com

Well Name:

MW-9

Site Location: 585 Union Street, Brooklyn, NY  
 Job Number: 14729  
 Client: Gowanus Union Street LLC

Installer: Coastal  
 Installation Method: Geoprobe/Auger  
 Installation Date: May 22 2023



Surface Pad	
Type:	Concrete

Well Cap	
Type:	PVC CAP

Annular Seal	
Type:	N/A
Length:	N/A
Interval (BEG):	N/A

Bentonite Seal	
Type:	Granular 3/8"
Length:	1'
Interval (BEG):	9-10'

Filter Pack	
Type:	Sand #2
Length:	10'
Interval (BEG):	10-20'

Riser Pipe	
Type:	Schedule 40 PVC
Diameter:	2"
Length:	5'
Interval (BEG):	5-10'

Surface Casing	
Type:	PVC CAP Stick up

Screen	
Type:	Schedule 40 PVC
Diameter:	2"
Length:	10'
Slot Size:	0.010"
Interval (BEG):	10-20'

Sump	
Type:	N/A
Diameter:	N/A
Length:	N/A

Bentonite Seal

Screened Interval





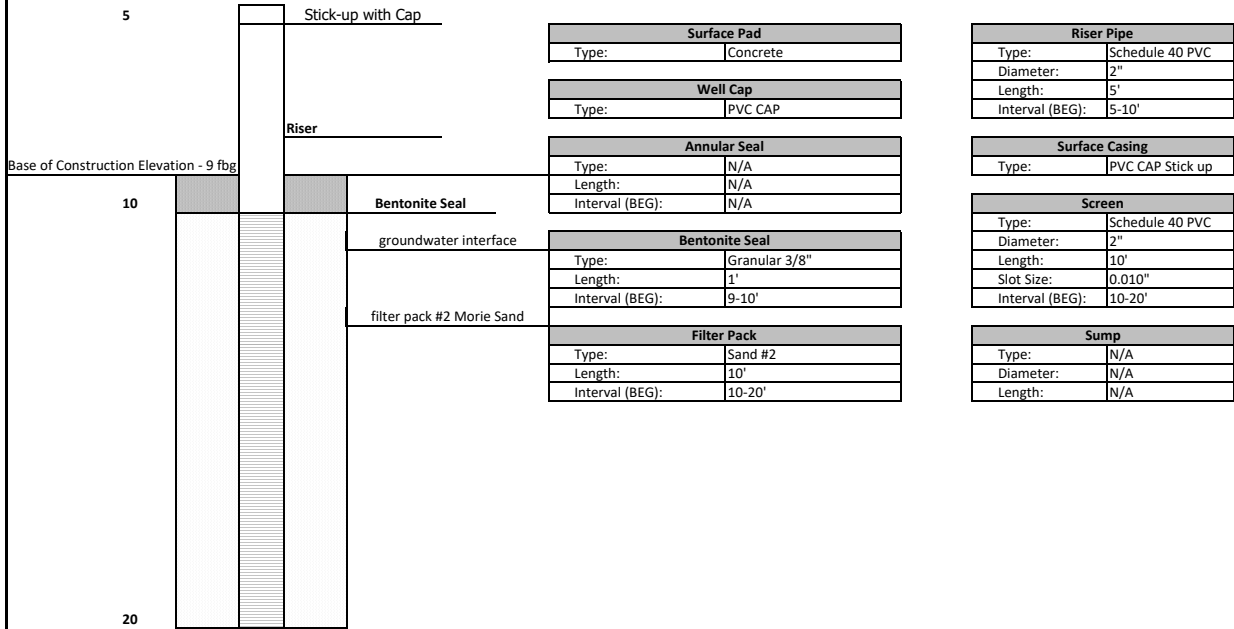
IMPACT ENVIRONMENTAL  
 170 Keyland Court, Bohemia, New York 11716  
 631.269.8800 telephone | 631.269.1599 facsimile  
 impactenvironmental.com

Well Name:

MW-10

Site Location: 585 Union Street, Brooklyn, NY  
 Job Number: 14729  
 Client: Gowanus Union Street LLC

Installer: Coastal  
 Installation Method: Geoprobe/Auger  
 Installation Date: May 22 2023



Surface Pad	
Type:	Concrete

Well Cap	
Type:	PVC CAP

Annular Seal	
Type:	N/A
Length:	N/A
Interval (BEG):	N/A

Bentonite Seal	
Type:	Granular 3/8"
Length:	1'
Interval (BEG):	9-10'

Filter Pack	
Type:	Sand #2
Length:	10'
Interval (BEG):	10-20'

Riser Pipe	
Type:	Schedule 40 PVC
Diameter:	2"
Length:	5'
Interval (BEG):	5-10'

Surface Casing	
Type:	PVC CAP Stick up

Screen	
Type:	Schedule 40 PVC
Diameter:	2"
Length:	10'
Slot Size:	0.010"
Interval (BEG):	10-20'

Sump	
Type:	N/A
Diameter:	N/A
Length:	N/A

Bentonite Seal

Screened Interval

# Appendix 5

## Excavation Work Plan

Site Management Plan  
NYSDEC BCP #C224329



IMPACT ENVIRONMENTAL  
170 Keyland Court  
Bohemia, New York 11716  
TEL: (631) 268-8800  
FAX: (631) 269-1599

# **NYSDEC BROWNFIELD CLEANUP PROGRAM**

**Excavation Work Plan – BCP # C224329**

**June 13, 2022**

*conducted at:*

**585 Union Street  
577-599 Union Street (also known as 586 Sackett Street)  
Brooklyn, New York  
County Tax Map Designation: *Block 433; Lot 28***

*Submitted to:*

**Division of Environmental Remediation  
New York State Department of Environmental Conservation  
625 Broadway  
Albany, New York, 12233-7020**

*Prepared For:*

**Gowanus Union Street LLC  
19 West 24<sup>th</sup> Street, 12<sup>th</sup> Floor  
New York, NY, 10010**

**IEC Project # 14729**



**IMPACT ENVIRONMENTAL ENGINEERING AND GEOLOGY, PLLC**

170 Keyland Court | Bohemia | New York | 11716 | 631.269.8800

## TABLE OF CONTENTS

Section	Topic	Page
	LIST OF ACRONYMS .....	2
	CERTIFICATION .....	3
1	INTRODUCTION .....	4
1.1	Notification .....	4
1.2	Soil Screening Methods.....	5
1.3	Soil Staging Methods.....	5
1.4	Materials Excavation and Load-Out .....	5
1.5	Materials Transport Offsite .....	6
1.6	Materials Disposal Offsite .....	7
1.7	Materials Reuse Onsite .....	7
1.8	Fluids Management.....	8
1.9	Construction Dewatering .....	8
1.10	Equipment Decontamination .....	9
1.11	Backfill from Offsite Sources .....	9
1.12	Stormwater Pollution Prevention .....	9
1.13	Excavation Contingency Plan .....	10
1.14	Community Air Monitoring Plan .....	10
1.15	Odor Control Plan.....	11
1.16	Dust Control Plan .....	12
1.17	Other Nuisances .....	12
1.18	Daily Reporting .....	12

## LIST OF ACRONYMS

<b>Acronym</b>	<b>Definition</b>
DER	Division of Environmental Remediation
E.I.T.	Engineer-in-Training
EWP	Excavation Work Plan
NYS DEC	New York State Department of Environmental Conservation
NYS DOH	New York State Department of Health
NYC RR	New York Codes, Rules, and Regulations
TCL	Target Compound List
QEP	Qualified Environmental Professional

### CERTIFICATION

I, Xin Yuan am a Professional Engineer (PE) as defined in §43-140. I have primary direct responsibility for implementation of the Excavation Work Plan (EWP) for the (318 Nevins, Brooklyn, NY) Site (DEC Site # C224329).

I certify that the EWP has a plan for the handling of soil, fill and other materials during excavation at the property in accordance with applicable City, State and Federal laws and regulations. This plan complies with provisions to control nuisances during invasive work, including dust suppression.

Xin Yuan, P.E.

Name

Signature:

*Xin Yuan*

Date:

6-13-2022



## 1 INTRODUCTION

### 1.1 Notification

At least 15 days prior to the start of any activity that is anticipated to encounter residual materials located on the Site, the Site owner or their representative will notify the New York State department of Environmental Conservation (NYSDEC). The following table 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 below:

Notifications	
Name	Contact Information
NYSDEC Remediation Project Manager: Rafi Alam	(518) 402-8606 <a href="mailto:Rafi.Alam@dec.ny.gov">Rafi.Alam@dec.ny.gov</a>
NYSDOH Project Manager: Public Health Specialist: Mark Sergott	(518) 402-7860 <a href="mailto:Mark.sergott@health.ny.gov">Mark.sergott@health.ny.gov</a>

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent of excavation, plans/drawings, estimated volumes of contaminated soil to be excavate.
- A summary of environmental conditions anticipated to be encountered in the work areas, including the nature and concentrations 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 Excavation Work Plan (EWP).
- A statement that the work will be performed in compliance with the EWP and 29 Code of Federal Regulations 1910.120.
- A copy of the contractor's health and safety plan, in electric format.
- Identification of disposal facilities for potential waste streams.
- Identification of sources of any anticipated backfill, along with all required chemical testing results.

## **1.2 Soil Screening Methods**

Visual, olfactory, and instrumental-based (e.g. photoionization detector [PID]) soil screening will be performed by a qualified environmental professional (EP) during all excavations into known or potentially contaminated material (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.

Soils will be segregated based on previous environmental data and screening results into material that requires offsite disposal and material that requires testing to determine if the material can be reused onsite as soil beneath a cover or if the material can be used as cover soil. Further discussion of offsite disposal of materials and onsite reuse is provided in Section 1.6 of this EWP.

## **1.3 Soil Staging Methods**

Any stockpiled soil material will be covered with 8-mil minimum polyethylene sheeting.

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.

Stockpiled material will always be kept covered 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.

## **1.4 Materials Excavation and Load-Out**

A qualified environmental professional (QEP) or person under their supervision will oversee all invasive work and the excavation and load-out of all excavated material.



The owner of the property (if applicable) and its contractors are responsible for safe execution of all intrusive and other work performed under this EWP. The presence of utilities and easements on the Site will be investigated by the QEP. 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 requirements.

A truck wash will be operated onsite, as appropriate. The QEP will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the Site. The truck wash waters will be collected and disposed of offsite in an appropriate manner. Locations where vehicles enter or exit the Site shall be inspected daily for evidence of offsite soil tracking.

The QEO will be responsible for ensuring that all egress points for truck and equipment transport from the Site are clean of dirt and other materials derived from the Site during intrusive excavation activities. Cleaning of the adjacent streets will be performed daily, at a minimum, as needed to maintain a clean condition with respect to site-derived materials.

### **1.5 Materials Transport Offsite**

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

Material transported by trucks exiting the Site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used. Truck transport routes will be determined based on where the proposed excavation will occur.

The most appropriate truck route will account for: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting offsite queuing of trucks entering the

facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport.

Trucks will be prohibited from stopping and idling in the neighborhood outside the project Site. Egress points for truck and equipment transport from the Site will be kept clean of dirt and other materials during Site remediation and development. Queuing of trucks will be performed onsite to minimize offsite disturbance. Offsite queuing will be prohibited.

### **1.6 Materials Disposal Offsite**

All material excavated and removed from the Site will be treated as contaminated and regulated material and will be transported and disposed of in accordance with all local, stat (including 6 NYCRR Part 360) and federal regulations. If disposal of material from this Site is proposed for unregulated offsite disposal (i.e., clean soil removed for developmental purposes), a formal request with an associated plan will be made to the NYSDEC. Unregulated offsite management of materials from the Site will not occur without formal NYSDECC approval.

Offsite 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 (i.e., hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, construction/demolition recycling facility, etc.). Actual disposal quantities and associated documentation will be reported to the NYSDEC. This documentation will include waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous historic fill and contaminated soils taken offsite will be handled, at a minimum, as a Municipal Solid Waste per 6 NYCRR Part 360-1.2. Material that does not meet Unrestricted Soil Cleanup Objectives is prohibited from being taken to a New York State recycling facility (6 NYCRR Part 360-16 Registration Facility).

### **1.7 Materials Reuse Onsite**

Chemical criteria for onsite reuse of material is subject to approval by NYSDEC prior to excavation work.

The QEP will ensure that procedures defined for materials reuse are followed and that unacceptable material does not remain onsite. Contaminated onsite material, including historic fill and contaminated soil, that is acceptable for reuse onsite 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.

### **1.8 Fluids Management**

All liquids to be removed from the Site, including but not limited to, decontamination waters and groundwater monitoring well purge and development waters, will be handled, transport, and disposed 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 offsite, 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 Discharge Elimination System permit.

### **1.9 Construction Dewatering**

Dewatering is not anticipated for the purposes of this EWP pertaining to the installation for a single pile on the Site. Should dewatering be needed at the Site, it will be done utilizing a pumping system, settling tanks, and possible treatment system.

Dewatering fluids are to be discharged to the local sanitary sewer system after treatment and under approved regulatory permit. Alternatively, the contractor may provide containerized storage to allow for testing of groundwater prior to, and after, treatment and before disposal. If required, Impact Environmental field personnel may sample dewatering treatment system liquids from either a discharge standpipe or a storage tank. Dewatering samples will be submitted to an NYSDEP ELAP-certified laboratory for analysis.

### **1.10 Equipment Decontamination**

Prior to arrival on the Site and between samples, sampling tools/equipment will be decontaminated using the following methods: 1) remove adherent soil material with stiff bristle brush; 2) wash with laboratory grade glassware detergent or Alconox; 3) steam clean interior and exterior of screen auger sampler and all associated augers; and 4) allow equipment to air dry.

### **1.11 Backfill from Offsite Sources**

All materials proposed for import onto the Site will be approved by the QEP. A Request to Import/Reuse Dill or Soil form (<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.

Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the Site.

All imported soils will meet the backfill and cover soil quality standards established in 6 NYCRR 375-6.7(d) and New York State Division of Environmental Remediation (DER)-10 Section 5.4(e). Based on an evaluation of the land use, the resulting soil quality standards are listed in Table 375-6.8(b) 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.

Trucks entering the Site with imported soils will be securely covered with tight-fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases. All stockpiles will be graded for stability and stored on poly sheeting.

### **1.12 Stormwater Pollution Prevention**

If applicable, 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 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.

### **1.13 Excavation Contingency Plan**

If underground tanks or other previously unidentified contaminant sources are found during excavations or development related to construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

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 (Target Analyte List metals; Target Compound List [TCL] volatiles and semi-volatiles, [TCL] pesticides, and polyvinyl chlorinated biphenyls [PCBs]), 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 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 to the NYSEDC in subsequent reporting.

### **1.14 Community Air Monitoring Plan**

Continuous air monitoring will be conducted for protection of the downwind community during site work activities, per the NYSDOH generic Community Air Monitoring Plan in DER-10 Appendix 1A. Continuous air monitoring for volatile organic compounds will be conducted by a minimum of one dedicated person

and will use approved instrumentation during ground intrusive activities. The following action levels have been established for air monitoring.

Parameter	Action Level	Action
Total particulates	2.5 times background and/or greater than 150 micrograms per cubic meter	Work ceases until mitigated
Volatile organic compounds	5 parts per million above background (15-minute average) at the downwind perimeter of the work zone	Work ceases until mitigated
Visible dust	Visible dust as determined by the Engineer	Work ceases until mitigated

### 1.15 Odor Control Plan

This Odor Control Plan is capable of controlling emissions of nuisance odors offsite. Specific odor control methods to be used on a routine basis will include odor masking agents. 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 all odor controls, including the halt of work, is the responsibility of the remedial party's Remedial Engineer, and any measures that are implemented will be provided to the NYSEDC in subsequent reporting.

All necessary means will be employed to prevent onsite and offsite nuisances. At a minimum, these measures will include: (a) limiting the area of open excavations and size of soil stockpiles; (b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (a) direct load-out of soils to trucks for offsite disposal; (b) use of chemical odorants in spray or misting systems; and (c) use of staff to monitor odors in surrounding neighborhoods.

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to onsite 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 system.

### **1.16 Dust Control Plan**

A dust suppression plan that addresses dust management during invasive onsite work will include, at a minimum, the following items:

- Dust suppression will be achieved by using a dedicated onsite water truck for road wetting. The truck will be equipped with a water cannon capable of 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.
- Onsite roads will be limited in total area to minimize the area required for water truck sprinkling.

### **1.17 Other Nuisances**

A plan for rodent control will be developed and utilized by the contractor prior to and during site clearing and 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.

### **1.18 Daily Reporting**

Daily reports providing a general summary of the activities for each day of active remedial work will be submitted to the NYSDEC and NYSDOH project managers by the end of each business day. The reports will include:

- BCP Site number and statement of the activities performed that day and an update of progress made as well as locations of excavation and other remedial work performed;
- Quantities of material imported and exported from the Site;
- Status of on-Site soil/fill stockpiles;
- A summary of all citizen complaints, with relevant details basis of complaint; actions taken, etc.);
- A summary of CAMP results noting all exceedances; and
- Photographs of notable Site conditions and activities.

The frequency of the reporting period may be revised in consultation with the NYSDEC and NYSDOH project managers based on the planned project tasks. Daily reports are not intended to be the primary mode of communication for notification to NYSDEC and NYSDOH of emergencies (accidents, spills), or other sensitive or time critical information. However, such information will be included in the daily reports.



# Appendix 6

HASP and CAMP

Site Management Plan  
NYSDEC BCP #C224329



IMPACT ENVIRONMENTAL  
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# **HEALTH AND SAFETY PLAN**

## **NYSDEC BROWNFIELD CLEANUP PROGRAM**

***Submitted for:***

**585 Union Street  
577-599 Union Street (also known as 586 Sackett Street)  
Brooklyn, New York  
County Tax Map Designation: Block 433; Lot 28**

***Submitted to:***

**New York State Department of Environmental Remediation, Region 2  
Division of Environmental Remediation  
625 Broadway  
Albany, New York 12233-7016**

***Prepared for:***

**Gowanus Union Street LLC  
19 West 24th Street, 12th Floor  
New York, NY, 10010**

**July 31, 2023**

***IEC Project Number: #14729***



## TABLE OF CONTENTS

Section	Topic	Page
<b>1</b>	<b>Introduction .....</b>	<b>1</b>
1.1	Purpose .....	1
<b>2</b>	<b>Application of Health and Safety Plan .....</b>	<b>2</b>
2.1	Restoration Personnel .....	2
2.2	Construction Personnel .....	2
<b>3</b>	<b>Key Personnel / Identification of Health &amp; Safety Personnel .....</b>	<b>3</b>
3.1	Key Personnel .....	3
3.2	Organizational Responsibility .....	3
3.2.1	<i>Senior Project Manager</i> .....	3
3.2.2	<i>Project Manager</i> .....	4
3.2.3	<i>Field Operations Leader</i> .....	4
3.2.4	<i>Site Health and Safety Officer</i> .....	4
<b>4</b>	<b>Chemical Hazard Analysis and Control Measures .....</b>	<b>6</b>
<b>4.1</b>	<b>Volatile Organic Compounds .....</b>	<b>6</b>
<b>4.2</b>	<b>Semi-Volatile Organic Compounds .....</b>	<b>6</b>
<b>4.3</b>	<b>Total Metals .....</b>	<b>7</b>
<b>5</b>	<b>Health and Safety Risk Analysis .....</b>	<b>8</b>
5.1	Explosion and Fire .....	8
5.1.1	<i>Flammable Vapors</i> .....	8
5.1.2	<i>High Oxygen Levels</i> .....	8
5.1.3	<i>Fire Prevention</i> .....	8
5.2	Operational Safety Hazards .....	9
5.2.1	<i>Heavy Machinery / Equipment</i> .....	9
5.2.2	<i>Vehicular Traffic</i> .....	9
5.3	Noise Hazards .....	9
5.4	Safe Material Handling .....	9
5.5	Temperature Hazards .....	10
5.5.1	<i>Types of Heat Stress</i> .....	10
5.5.2	<i>Heat Stress Prevention</i> .....	11
5.6	Cold Exposure Hazards .....	11
5.7	Community Air Monitoring Program (CAMP) .....	12
<b>6</b>	<b>Personnel Training .....</b>	<b>14</b>
6.1	Pre-assignment and OSHA Training .....	14
6.2	Respirator Requirements .....	14
6.2.1	<i>Respirator Requirements and Fit Testing</i> .....	14
6.2.2	<i>Medical Surveillance</i> .....	15
<b>7</b>	<b>Personal Protective Equipment .....</b>	<b>16</b>
7.1.1	<i>Levels of Protection</i> .....	16
7.1.2	<i>Level D Personal Protective Equipment</i> .....	16
7.1.3	<i>Modified Level D Personal Protective Equipment</i> .....	17
7.1.4	<i>Level C Personal Protective Equipment</i> .....	17
7.1.5	<i>Level B Personal Protective Equipment</i> .....	17
7.1.6	<i>Personal Use Factors and Equipment Change Out Schedule</i> .....	18
<b>8</b>	<b>Work Zones .....</b>	<b>20</b>
8.1	Work Zone Definitions .....	20
8.1.1	<i>Exclusion Zone (EZ)</i> .....	20
8.1.2	<i>Contaminant Reduction Zone (CRZ)</i> .....	20
8.1.3	<i>Support Zone (SZ)</i> .....	20
<b>9</b>	<b>General Safety and Health Provisions .....</b>	<b>23</b>
9.1	Safety Practices / Standing Orders .....	23

9.2	Buddy System.....	24
9.3	Site Communications Plan.....	24
9.4	Retention of Records.....	24
<b>10</b>	<b>Decontamination Plan .....</b>	<b>25</b>
10.1	General.....	25
10.2	Minimum Decontamination Procedure .....	25
10.3	Standard Decontamination Procedure.....	26
10.3.1	Level B .....	26
10.3.2	Level C and Level D.....	26
10.4	Heavy Equipment and Handling Equipment Decontamination.....	26
<b>11</b>	<b>Emergency Response / Contingency Plan .....</b>	<b>28</b>
11.1	Pre-Emergency Planning .....	28
11.2	Emergency Contact Information .....	28
11.2.1	Emergency Contacts.....	28
11.2.2	Utility Emergencies / Initiating Subsurface Investigation Work.....	31
11.3	Contingency / Evacuation Plan.....	31
11.4	Emergency Medical Treatment Procedures.....	31
11.4.1	Standard Procedures for Injury .....	32
11.4.2	Chemical Overexposure.....	32
11.4.3	First Aid for Injuries Incurred During Field Work .....	33
11.4.4	First Aid Equipment List.....	33
11.4.5	Other Emergency Equipment .....	34
11.5	Record of Injuries Incurred On-Site.....	34
11.5.1	Occupational Injuries and Illnesses Form (OSHA 200).....	34
11.5.2	Employer’s First Report of Injury .....	34

## **APPENDICES**

- Appendix A: Acknowledgment Statement
- Appendix B: OSHA Respirator Medical Evaluation Questionnaire
- Appendix C: OSHA Form 200-Occupational Injuries & Illnesses
- Appendix D: Safety Data Sheets
- Appendix E: Accident Report Form

## 1 Introduction

This Health and Safety Plan (HASP) describes the procedures to be followed in order to reduce employee exposure to potential health and safety hazards that may be present during environmental investigation activities being performed at the Site. The emergency response procedures necessary to respond to such hazards are also described within this HASP. All activities performed under this HASP are targeted to comply with Occupational Safety and Health Administration (OSHA) Regulations 29 CFR Part 1910.1025.

This document is not, nor does it purport to be, a complete description of all safety and health requirements applicable to work performed at the site. Rather, the HASP is a general overview of the compliance policies and work practices applicable to the primary tasks and hazards associated with the environmental assessment portion of the development project, as well as a recitation of minimum safety and health compliance obligations for contractors, subcontractors and workers at the site. All subcontractors of any tier operating at the worksite are obligated to implement and maintain comprehensive safety and health plans for their own employees and to ensure that their employees comply with all applicable safety and health requirements. All subcontractors operating at the worksite should refer to the applicable specific OSHA Standards for detailed requirements.

### 1.1 Purpose

The purpose of this HASP is to provide the contractors' field personnel, as well as other site-occupants, with an understanding of the potential chemical and physical hazards that exist or may arise while portions of this project are being performed. To this end, this HASP also presents information on the progression of the environmental restoration activities and specific details regarding the handling of materials excavated from the Site.

The primary objective is to ensure the well being of all field personnel and the community surrounding this site. In order to accomplish this, project staff and approved subcontractors of any tier shall acknowledge and adhere to the policies and procedures established herein. Accordingly, all personnel assigned to the remediation activities associated with this project (Remedial Personnel) shall read this HASP and sign the Agreement and Acknowledgment Statement (**Appendix A**) to certify that they have read, understood, and agree to abide by its provisions. A copy of this HASP will be available to anyone that requests it. Personnel involved in construction activities (Construction Personnel) and other Personnel (e.g. government officials, administrators, bank inspectors, assessors, etc.) that will have limited exposure to the site native soil/fill material during construction activities will be instructed on how to reduce the probability of exposure to site contaminants, but will not be required read the HASP.

## 2 Application of Health and Safety Plan

The procedures of this HASP apply for any person that will enter the boundaries of the site or a portion of the Site during environmental investigation/remediation activities or construction, until the existing soil/fill material has been covered with either a paved surface or an uncontaminated soil cap. When the Project Manager has designated an area of the site as clear of any environmental issues, construction contractors and subcontractors of any tier will perform the balance of the work in accordance with their individual OSHA-compliant corporate HASP.

### 2.1 Restoration Personnel

Employees of contractors and subcontractors of any tier performing the following activities will be considered Restoration Personnel:

- Excavation of native soil/fill material
- Loading of native soil/fill onto vehicles
- Processing of native soil/fill into components
- Transporting of native soil/fill across the site
- Sampling of native soil/fill material for subsequent physical or chemical analysis
- Cleaning or decontaminating equipment or personnel
- Handling of ground waters

All subcontractors, of any tier, must submit a HASP to the Site Health and Safety Officer for review and approval prior to mobilizing to the site. Only HASPs that comply with this HASP will be approved. Where a subcontractors HASP is deficient, the Site Health and Safety Officer will provide written notification of any required changes. Approved HASPs will be submitted to the Project Manager and retained on-site for reference by the Site Health and Safety Officer.

### 2.2 Construction Personnel

For this document, "Construction Personnel" is the term given for those employees of contractors and subcontractors of any tier performing activities associated with site development other than those performed by the Remedial Personnel. This designation does not preclude that Construction Personnel will traverse or work upon native soil/fill material, rather, it infers that it will not involve performing tasks that will create a route of exposure to the contaminants contained therein. Construction Personnel will receive instruction to limit the potential for exposure to these contaminants. Construction Personnel will be prohibited from entering Environmental Remediation Areas (i.e., active excavation / handling / processing areas, loading areas, exclusion zones or support zones).

### 3 Key Personnel / Identification of Health & Safety Personnel

#### 3.1 Key Personnel

A list of the pertinent personnel authorized to be present on site is as follows:

<b>Title</b>	<b>Name</b>	<b>Telephone Number</b>
Senior Project Manager <i>Impact Environmental</i>	Kevin Kleaka	(O) 631-269-8800 ext: 129 (C) 631-252-5480
Project Manager <i>Impact Environmental</i>	Diana Posten	(O) 631-269-8800 ext: 189 (C) (631) 664-4425
Field Operations Leader <i>Impact Environmental</i>	Manan Dalal	(O) 631-269-8800 ext: 121 (C) 631-901-2470
Site Health & Safety Officer <i>Impact Environmental</i>	Leif Robertson	(O) 631-269-8800 ext: 197 (C) 631-275-4865

#### 3.2 Organizational Responsibility

##### 3.2.1 Senior Project Manager

The Senior Project Manager will be responsible for implementing the project and obtaining any necessary personnel or resources for the completion of the project. Specific duties will include:

- Selecting a Site Health and Safety Officer and field personnel for the work to be undertaken on site;
- Providing authority and resources to ensure that the Site Health and Safety Officer is able to implement and manage safety procedures;
- Preparing reports and recommendations about the project to clients and affected personnel;
- Ensuring that all persons allowed to enter the site (e.g., EPA, contractors, state officials, visitors) are made aware of the potential hazards associated with the substances known or suspected to be on site, and are knowledgeable as to the on-site copy of the specific HASP; and
- Ensuring that the Site Health and Safety Officer is aware of all of the provisions of this HASP and is instructing all personnel on site about the safety practices and emergency procedures defined in the plan.



### 3.2.2 *Project Manager*

The Project Manager will be responsible for implementing the Senior Project Manager' duties as well as oversee activities regarding the project both in the field and in the office as well as interact with environmental regulatory agencies, sub-contractors and internal company personnel.

- Coordinating the activities of all construction and Remedial Personnel, to include informing them of the required Personal Protective Equipment (PPE) and ensuring their signature acknowledging this HASP;
- Ensuring that the tasks assigned are being completed as planned and on schedule; and
- Serving as liaison with public officials where there is no Public Affairs official designated.

### 3.2.3 *Field Operations Leader*

The Field Operations Leader will be responsible for field operations and safety. Specific duties will include, but are not limited to:

- Scheduling with the construction company and their subcontractors;
- Coordinating with the Site Health and Safety Officer in determining protection levels;
- Documenting field activities;
- Coordinate activities between environmental and construction personnel;
- Coordination with waste management contractors; and
- Review and approval of waste disposal facilities.

In the event that the Project Manager and the Site Health and Safety Officer are not on site, the Field Operations Leader will assume all responsibility of the Site Health and Safety Officer.

### 3.2.4 *Site Health and Safety Officer*

The Site Health and Safety Officer shall be responsible for the implementation of the HASP on site. Specific duties will include:

- Monitoring the compliance of construction and environmental remediation activities personnel (field personnel) for the routine and proper use of the PPE that has been designated for each task;
- Routinely inspecting PPE and clothing to ensure that it is in good condition and is being stored and maintained properly;
- Stopping work on the site or changing work assignments or procedures if any operation threatens the health and safety of workers or the public;
- Monitoring personnel who enter and exit the site and all controlled access points;

- Reporting any signs of fatigue, work-related stress, or chemical exposures to the Project Manager;
- Dismissing field personnel from the site if their actions or negligence endanger themselves, co-workers, or the public, and reporting the same to the Project Manager;
- Reporting any accidents or violations of the HASP plan to the Project Manager and documenting the same for the project in the records;
- Knowing emergency procedures, evacuation routes, and the telephone numbers of the ambulance, local hospital, poison control center, fire and police departments;
- Ensuring that all project-related personnel have signed the personnel agreement and acknowledgments form contained in this HASP; and
- Coordinate upgrading and downgrading PPE as necessary due to changes in exposure levels, monitoring results, weather, and other site conditions.

## 4 Chemical Hazard Analysis and Control Measures

Based on historical subsurface investigations performed at the Site in 2019 and 2020 by Roux Associates (Roux) and Impact Environmental Consultants (IEC), the contaminants of concern include the following:

- Volatile organic compounds (VOC's) identified in soil: benzene, toluene, ethylbenzene, total xylenes, n-propylbenzene, 1,3,5-trimethylbenzene and 1,2,4-trimethylbenzene;
- Semi-volatile organic compounds (SVOC's) identified in soil: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene, fluoranthene, naphthalene, dibenzofuran, 2-methylphenol, 3-methylphenol/4-methylphenol;
- Metals identified in soil: arsenic, barium, copper, lead, mercury, nickel and zinc;
- VOCs identified in groundwater: benzene, isopropylbenzene, n-propylbenzene and 1,2,4,5-tetramethylbenzene;
- Metals identified in groundwater: Arsenic (total), barium (total), chromium (total), iron (total), lead (total), magnesium (total), manganese (total), nickel (total), sodium (total) and thallium (total).
- VOCs identified in soil vapor: Trichloroethene (TCE).

VOCs, SVOCs and metals were detected in both soil and groundwater samples. In addition, TCE was detected in soil vapor samples. A summary of the health hazards associated with the contaminant of concerns are shown below.

### 4.1 Volatile Organic Compounds

The supplemental remedial investigation performed at the Site have identified gasoline related VOC's in soil and groundwater, as well as TCE in soil vapor.

Soil and groundwater sample results indicated elevated concentrations of VOCs, including benzene, toluene, ethylbenzene and total xylenes, in samples located adjacent to a former heating oil underground storage tanks (UST) and a former gasoline UST. In addition, soil vapor sampling results indicate elevated concentrations of TCE in sample SV-1, located in the western warehouse building. Prolonged exposure to VOCs above their respective OSHA permissible exposure limits may result in irritation of the mucous membranes of the respiratory system, eyes, and mouth. Overexposure to VOCs may also result in the depression of the central nervous system. Symptoms may include drowsiness, headache, and fatigue.

### 4.2 Semi-Volatile Organic Compounds

The supplemental remedial investigation performed at the Site have identified Polycyclic Aromatic Hydrocarbons (PAHs) related SVOC's in soil above applicable standards throughout the Site. These SVOCs include Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo (a,h)-anthracene, and indeno(1,2,3-cd)pyrene.

In addition, soil samples collected adjacent to a former heating oil UST and a former gasoline UST contained elevated concentrations of SVOCs related to fuel oil. Prolonged exposure to SVOCs above OSHA permissible exposure limits may result in adverse health effects including endocrine and thyroid disruption, immunotoxicity, reproductive toxicity, cancer, and adverse effects on fetal and child development and neurologic function.

#### **4.3 Total Metals**

The supplemental remedial investigation performed at the Site have identified heavy metals in soil and groundwater throughout the Site. Specifically, arsenic, barium, cadmium, copper, lead, mercury, nickel and zinc.

Prolonged exposure to the above mentions metals above OSHA permissible exposure limits may result in adverse health effects including endocrine and thyroid disruption, immunotoxicity, reproductive toxicity, cancer, and adverse effects on fetal and child development and neurologic function.

## 5 Health and Safety Risk Analysis

The field tasks covered by the HASP will include supplemental investigated task such as, drilling, and containerization of soil/groundwater/soil vapor samples. Additionally, standard job task hazards that are inherent to an investigative project will exist.

### 5.1 Explosion and Fire

This Section is not, nor does it purport to be, a comprehensive recitation of safety and health requirements applicable to explosion and fire. Rather, contractors, subcontractors and workers at the site must refer to OSHA's Fire Protection and Prevention Standard, set forth at 29 C.F.R. § 1910 part 1926.35, as well as all supporting OSHA Compliance Directives and Letters of Interpretation, for complete information on safety and health compliance obligations. The following are possible fire and explosion hazards that may be encountered on the job site along with fire preventive measures to take.

#### 5.1.1 *Flammable Vapors*

The presence of flammable vapors can pose a potential fire and health hazard. Hazard reduction procedures include monitoring the ambient air with an oxygen/LEL meter (combustible gas indicator). If the LEL reading exceeds 20%, all work will stop and employees will leave the site immediately and contact the fire department. For OSHA-defined "confined space" activities, work will stop if the LEL reading exceeds 10%.

#### 5.1.2 *High Oxygen Levels*

Atmospheres that contain a level of oxygen greater than 23% pose an extreme fire hazard (the usual ambient oxygen level is approximately 20.5%). All personnel encountering atmospheres that contain a level of oxygen greater than 23% must evacuate the site immediately and must notify the Fire Department. If the oxygen level is less than 19.5%, do not enter the space without level B PPE.

#### 5.1.3 *Fire Prevention*

- During equipment operation, periodic vapor concentration measurements should be taken with an explosimeter or combustimeter. If at any time the vapor concentrations exceed 20% of the lower explosive limit (LEL), then the Site Health and Safety Officer or designated field worker should immediately shut down all operations.
- Only approved safety cans will be used to transport and store flammable liquids.
- All gasoline and diesel-driven engines requiring refueling must be shut down and allowed to cool prior to filling.
- Smoking is not allowed during any operations within the work area in which petroleum products or solvents in free-floating, dissolved, or vapor forms, or other flammable liquids may be present.
- No open flame or spark is allowed in any area containing petroleum products or other flammable liquids.

## 5.2 Operational Safety Hazards

This Section is not, nor does it purport to be, a comprehensive recitation of safety and health requirements applicable to earth moving equipment. Rather, contractors, subcontractors and workers at the site must refer to OSHA's Excavation Standard, set forth at 29 C.F.R. § 1910 Subpart P as well as all supporting OSHA Compliance Directives and Letters of Interpretation, for complete information on safety and health compliance obligations.

### 5.2.1 *Heavy Machinery / Equipment*

All site employees must remain aware of those site activities that involve the use of heavy equipment and machinery. Respiratory protection and protective eyewear may be worn frequently during site activities. This protective equipment significantly reduces peripheral vision of the wearer. Therefore, it is essential that all employees at the site exercise extreme caution during operation of equipment and machinery to avoid physical injury to themselves or others.

### 5.2.2 *Vehicular Traffic*

All employees will be required to wear a fluorescent safety vest at all times while on site. In addition, supplemental traffic safety equipment use can be exercised when warranted by specific task. Supplemental equipment can be items such as cones, flags, barricades, and/or caution tape. Drivers of waste transportation vehicles will only exit vehicles in designated areas within the Support Zone. During this time, drivers will only be allowed to inspect the placement of waste loads and cover their trailers.

## 5.3 Noise Hazards

This Section is not, nor does it purport to be, a comprehensive recitation of safety and health requirements applicable to noise hazards. Rather, contractors, subcontractors and workers at the site must refer to OSHA's Occupational Noise Exposure Standard, set forth at 29 C.F.R. § 1910 part 1926.52, as well as all supporting OSHA Compliance Directives and Letters of Interpretation, for complete information on safety and health compliance obligations.

Hearing protection shall be provided to the employees where sound pressure levels exceed 85 dB. Hearing protection shall be worn where sound pressure levels in areas and/or on equipment exceeds 90 dB. Typical heavy excavation operations have been monitored with a sound level meter and indicate that hearing protection is required for all personnel while engaged in this action.

## 5.4 Safe Material Handling

This Section is not, nor does it purport to be, a comprehensive recitation of safety and health requirements applicable to safe material (soil/fill) handling. Rather, contractors, subcontractors and workers at the site must refer to OSHA's Eye and Face, and Respiratory Safety Standards, set forth at 29 C.F.R. § 1910 Parts 1926.102 and 1926.103

as well as all supporting OSHA Compliance Directives and Letters of Interpretation, for complete information on safety and health compliance obligations.

Skin and eye contact with contaminated soil/fill or materials in contact with the soil/fill may occur during excavation, drilling, sampling, handling and decontamination activities. Nitrile gloves and approved safety glasses must be worn to prevent exposure to the associated contaminants. Employees working at or near (within ten feet of) excavation fronts could be required to wear respiratory protection. If necessary, all associated activities will be performed pursuant to 29 C.F.R. § 1910 Parts 1926.134 (a)(2) and 1926.55.

## 5.5 Temperature Hazards

This Section is not, nor does it purport to be, a comprehensive recitation of safety and health requirements applicable to temperature stresses. Rather, contractors, subcontractors and workers at the site must refer to OSHA's Technical Manual (TED 1-0.15A), Section III – Chapter 4 (1999) as well as all supporting OSHA Compliance Directives and Letters of Interpretation, for complete information on safety and health compliance obligations.

Since climatic changes cannot be avoided, work schedules will be adjusted to provide time intervals for intake of juices, juice products, and water in an area free from contamination and in quantities appropriate for fluid replacement to prevent heat stress conditions from occurring.

### 5.5.1 *Types of Heat Stress*

Heat stress may occur even in moderate temperature areas and may present any or all of the following:

#### 5.5.1.1 Heat Rash

Result of continuous exposure to heat, humid air, and chafing clothes. Heat rash is uncomfortable and decreases the ability to tolerate heat.

#### 5.5.1.2 Heat Cramps

Result of the inadequate replacement of body electrolytes lost through perspiration. Signs include severe spasms and pain in the extremities and abdomen.

#### 5.5.1.3 Heat Exhaustion

Result of increased stress on the vital organs of the body in the effort to meet the body's cooling demands. Signs include shallow breathing; pale, cool, moist skin; profuse sweating; and dizziness.

#### 5.5.1.4 Heat Stroke

Result of overworked cooling system. Heat stroke is the most serious form of heat stress. Body surfaces must be cooled and medical help must be obtained immediately to prevent severe injury and/or death. Signs include red,

hot, dry skin, absence of perspiration, nausea, dizziness and confusion, strong, rapid pulse that could lead to coma or death.

#### 5.5.2 Heat Stress Prevention

- A. Replace body fluids (water and electrolytes) lost through perspiration. Solutions may include a 0.1% salt and water solution or commercial mixes such as "Gatorade". Employees must be encouraged to drink more than the amount required in order to satisfy thirst.
- B. Use cooling devices to aid the natural body ventilation. Cooling occurs through evaporation of perspiration and limited body contact with heat-absorbing protective clothing. Utilize fans and air conditioners to assist in evaporation. Long, cotton underwear is suggested to absorb perspiration and limit any contact with heat-absorbing protective clothing (i.e., coated Tyvek suits).
- C. Conduct non-emergency response activities in the early morning or evening during very hot weather.
- D. Provide shelter against heat and direct sunlight to protect personnel. Take breaks in shaded areas.
- E. Rotate workers utilizing protective clothing during hot weather.
- F. Establish a work regime that will provide adequate rest periods, with personnel working in shifts.

#### 5.6 Cold Exposure Hazards

Work schedules will be adjusted to provide sufficient rest periods in a heated area for warming up during operations conducted in cold weather. Also, thermal protective clothing such as wind and/or moisture resistant outerwear is recommended to be worn.

If work is performed continuously in the cold at or below -7 °C (20 °F), including wind chill factor, heated warming shelters (tents, cabins, company vehicles, rest rooms, etc.) shall be made available nearby and the worker should be encouraged to use these shelters at regular intervals, the frequency depending on the severity of the environmental exposure. The onset of heavy shivering, frostnip, the feeling of excessive fatigue, drowsiness, irritability, or euphoria, are indications for immediate return to the shelter. When entering the heated shelter, the outer layer of clothing shall be removed and the remainder of the clothing loosened to permit sweat evaporation. A change of dry work clothing shall be provided as necessary to prevent workers from returning to their work with wet clothing.

Dehydration, or the loss of body fluids, occurs in the cold environment and may increase the susceptibility of the worker to cold injury due to a significant change in blood flow to the extremities. Warm sweet drinks and soups should be provided at the work site to provide caloric intake and fluid volume. The intake of coffee should be limited because of a diuretic and circulatory effect (adapted from TLV's and Biological Exposure Indices 1988-1989, ACGIH).



### 5.7 Community Air Monitoring Program (CAMP)

Real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary during the Remedial Investigation as Per NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation.

- 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.

- 5 If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m<sup>3</sup>) 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<sup>3</sup> above the upwind level and provided that no visible dust is migrating from the work area.
- 6 If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m<sup>3</sup> 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<sup>3</sup> of the upwind level and in preventing visible dust migration.
- 7 All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

## **6 Personnel Training**

### **6.1 Pre-assignment and OSHA Training**

All Remedial Personnel that will be in direct contact (that is hand digging, sampling, processing) with the native soil/fill materials must complete an initial 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training course and, where necessary, a current eight hour refresher course (as required annually after initial 40-hour training completion). Restoration Personnel that will not be in direct contact with native soil/fill materials are only required to prove they have read and understood the procedures presented in this HASP.

On-site managers and supervisors of Restoration Personnel (Field Operations Leader, Site Health and Safety Officer) directly responsible for employees engaged in hazardous substance operations have received an initial 40-hour HAZWOPER training course and an additional (above the 40-hour HAZWOPER) eight hours of supervisory training. These training requirements comply with the OSHA Hazardous Waste Operations and Emergency Response Regulation, 29 CFR 1910.120. The Site Health and Safety Officer will be certified in First Aid and Cardiovascular Pulmonary Resuscitation.

The Site Health and Safety Officer will conduct an on-site training meeting for all Construction Personnel and observers that could potentially be exposed to the native soil/fill material during construction activities. Training meetings will be provided routinely for any new project personnel. This program will cover specific health and safety equipment and protocols and potential problems inherent to each project operation. The Site Health and Safety Officer will be present for any activities being performed by Construction Personnel that will involve the handling of soil/fill during construction activities to provide supervision on exposure reduction. This may include insuring the use of proper PPE and air quality monitoring.

### **6.2 Respirator Requirements**

#### **6.2.1 *Respirator Requirements and Fit Testing***

The OSHA respiratory protection standard, 29 CFR 1910.134, under paragraph (f)(2), requires fit testing for all employees using tight fitting respirators including filtering facepiece respirator. The fit test must be performed before the respirator is used and must be repeated at least annually and whenever a different respirator facepiece is used or a change in the employee's physical condition could affect the respirator fit.

The user seal check is a separate requirement under paragraph (g)(1)(iii) and must be performed each time the employee dons the respirator. Employers must adhere to the recommendations of the respirator's manufacturer; different manufacturers recommend different procedures.

### *6.2.2 Medical Surveillance*

OSHA requires a medical evaluation to determine whether each employee required to wear a respirator is physically able to wear a respirator and perform the work. This evaluation can be a medical examination or an evaluation of employee responses to the OSHA Respirator Medical Evaluation Questionnaire located in **Appendix B** of the Respiratory Protection Standard. Either method must be performed by a physician or other licensed healthcare professional. **Appendix C** has a copy of the forms to be completed.

A medical examination may be necessary whenever the employee gives a positive response to any of questions 1 through 8 in Appendix B, Part A, Section 2.

## **7 Personal Protective Equipment**

This Section is not, nor does it purport to be, a comprehensive recitation of safety and health requirements applicable to personal protective equipment. Rather, contractors, subcontractors and workers at the site must refer to OSHA's Personal Protective Equipment Standard, set forth at 29 C.F.R. § 1910. Part 1926.28(a) as well as all supporting OSHA Compliance Directives and Letters of Interpretation, for complete information on safety and health compliance obligations.

The purpose of personal protective clothing and equipment (PPE) is to shield or isolate individuals from the chemical, physical, and biological hazards that may be encountered on-site when engineering and other controls are not feasible or cannot provide adequate protection. Careful selection and use of adequate PPE should protect the health of all on-site workers. No single combination of PPE is capable of protecting against all hazards. Therefore, PPE should be used in conjunction with, not in place of, other protective methods, such as engineering controls and safe work practices.

Site-specific chemicals of concern include semi-volatile organic compounds. These chemicals are of moderate to low hazard. Therefore, level D personal protective equipment will be required at all times when on site. The following is a breakdown of the types of protective clothing and equipment to be used during the site activities.

### *7.1.1 Levels of Protection*

The Site Health and Safety Officer will determine whether a level of protection should be upgraded or downgraded. Changes in the level of protection will be recorded in the dedicated site logbook along with the rationale for the changes (see Section 7.1.3 for additional information on PPE upgrades). Level D PPE will be the minimum requirement at all times during the environmental remediation portion of the project.

### *7.1.2 Level D Personal Protective Equipment*

All initial site access and activities will be done in Level D attire. Level D protection is sufficient under conditions where no contaminants are present or those activities that do not pose a potential threat of unexpected inhalation of or contact with hazardous levels of any substances. Typical Level D activities may include sediment, logging and groundwater sampling, and as surficial site surveys.

- Hard hat
- Safety glasses (as appropriate)
- Steel toe and shank boots
- Fluorescent vest
- Hearing protection (as appropriate)

#### *7.1.3 Modified Level D Personal Protective Equipment*

- Hard hat
- Safety glasses
- Steel toe and shank boots
- Fluorescent vest
- Nitrile "N-Dex" inner gloves
- Latex outer boots (chemical resistant)
- Polyethylene coated Tyvek suit
- Hearing protection (as appropriate)

#### *7.1.4 Level C Personal Protective Equipment*

Level C protection, as described in this plan, will be available at a minimum for those activities that involve surface and subsurface soil (strata disturbance such as well installation, and all subsurface media sampling activities such as split-spoon sampling and borings). Level C protection equipment should be readily available at all times. Consistent with OSHA training, prior to donning Level C, oxygen percent must be continuously monitored.

- Buddy system required at all times
- Full face respirator with NIOSH approved OV/AG/HEPA combination cartridges (MSA GMC-H)
- Saranex coated Tyvek Suit
- Inner Nitrile "N-Dex" gloves
- Outer Nitrile (NBR) gloves
- Steel toe and shank boots
- Outer boots (chemical resistant)
- Hard hat
- Hearing protection (as appropriate)

#### *7.1.5 Level B Personal Protective Equipment*

Some activities may require Level B protection. In atmospheres potentially containing toluene and xylenes, the protective ensemble should include chemical resistant clothing since the two compounds have skin absorption potential.

Regional Health and Safety representatives must be on site upon start-up of any project requiring level B protection. This should be understood to include subcontractors conducting Level B activity.

- Buddy system required at all times
- Supplied air respirator or SCBA
- Saranex coated Tyvek Suit
- Inner Nitrile "N-Dex" gloves

- Outer Nitrile (NBR) gloves
- Steel toe and shank boots
- Outer boots (chemical resistant)
- Hard hat
- Hearing protection (as appropriate)

*7.1.6 Personal Use Factors and Equipment Change Out Schedule*

Prohibitive or precautionary measures should be taken as necessary to prevent workers from jeopardizing safety during equipment use.

If necessary, all respiratory protective equipment used will be approved by NIOSH/MSHA. Respirator cartridges will be changed once per eight-hour shift at a minimum. This can be accomplished at the end of the workday during respirator decontamination. Employees working within the excavation front should change the cartridge of their respirators once every four hours. If odor breakthrough is detected while wearing the respirator or if breathing becomes difficult, change cartridges immediately. A filter change out schedule is provided below.

<b>Remedial Worker</b>	<b>Work Area</b>	<b>Filter Type</b>	<b>Replacement Rate</b>
Site Screener	EZ – At Excavation Front	MSA GMC-H	Every 4 Hours
Laborer	EZ – At Excavation Front	MSA GMC-H	Every 2 Hours
	SZ, CRZ	MSA GMC-H	Every 8 Hours
Equipment Operator	EZ	MSA GMC-H	Every 4 Hours
	SZ, CRZ	MSA GMC-H	Every 8 Hours
Administrator	EZ	MSA GMC-H	Every 4 Hours
	SZ, CRZ	MSA GMC-H	Every 8 Hours

\*Work Area Definitions are discussed in the following Section (8.1)

When utilizing protective garments such as Tyvek suits, gloves, and booties, all seams between protective items will be sealed with duct tape.

Contact with contaminated surfaces, or surfaces suspected of being contaminated, should be avoided. This includes walking through, kneeling in, or placing equipment in puddles, mud, discolored surfaces, or on drums and other containers.

Eating, smoking, drinking, and/or the application of cosmetics in the immediate work area is prohibited. Ingestion of contaminants or absorption of contaminants into the skin may occur.

The use of contact lenses on the job site is strongly advised against. Contact lenses may trap contaminants and/or particulate between the lens and eye, causing irritation. However, when glasses are not available, contact lenses are preferred over faulty vision. When contact lenses are worn, safety glasses and/or goggles must be worn at all times while on the job site. Wearing contact lenses with a respirator in a contaminated atmosphere is prohibited under 29 CFR ss1910.134 (e)(5)(iii).



## **8 Work Zones**

### **8.1 Work Zone Definitions**

Work and support areas shall be established based on ambient air data and proposed work sites. They shall be established in order to contain contamination within the smallest areas possible and shall ensure that each employee has the proper PPE for the area or zone in which work is to be performed.

#### *8.1.1 Exclusion Zone (EZ)*

It is within this zone that the excavation or environmental remediation activities such as tank abandonment, system installation or other soil disturbance operations are performed. No one shall enter this zone unless the appropriate PPE is donned. The location of this zone will change as the construction-related excavation activities are performed.

#### *8.1.2 Contaminant Reduction Zone (CRZ)*

It is within this zone that the decontamination process is undertaken. Personnel and their equipment must be adequately decontaminated before leaving this zone for the support zone. This zone will be set up between the EZ (no less than 100 feet away) and the site boundary.

#### *8.1.3 Support Zone (SZ)*

The support zone is considered to be uncontaminated; as such, protective clothing and equipment are not required but should be available for use in emergencies. All equipment and materials are stored and maintained within this zone. Protective clothing is put on within the SZ before entering the EZ or the CRZ. The SZ will be established in a safe environment at least 50 feet away from the EZ.

## 9 General Safety and Health Provisions

This Section is not, nor does it purport to be, a comprehensive recitation of safety and health requirements applicable to general safety and health provisions. Rather, contractors, subcontractors and workers at the site must refer to OSHA's General Safety and Health Provision Standard, set forth at 29 C.F.R. § 1910 subparts C and G as well as all supporting OSHA Compliance Directives and Letters of Interpretation, for complete information on safety and health compliance obligations.

### 9.1 Safety Practices / Standing Orders

The following are important safety precautions that will be enforced during work activities.

1. Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated.
2. Hands and face must be thoroughly washed upon leaving the work area and before eating, drinking, or any other activity.
3. Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garments are removed.
4. No excessive facial hair that interferes with the effectiveness of a respirator will be permitted on personnel required to wear respiratory protection equipment. The respirator must seal against the face so that the wearer receives air only through the air purifying cartridges attached to the respirator. Fit testing shall be performed prior to respirator use to ensure the wearer obtains a proper seal.
5. Contact with potentially contaminated surfaces should be avoided whenever possible. One should not walk through puddles; kneel on the ground; lean, sit, or place equipment on drums, containers, vehicles, or the ground.
6. Medicine and alcohol can potentate the effect from exposure to certain compounds. Prescribed drugs and alcoholic beverages should not be consumed by personnel involved in the project.
7. Personnel and equipment in the work areas should be minimized, consistent with effective site operations.
8. Work areas for various operational activities should be established.
9. Procedures for leaving the work area must be planned and implemented prior to going to the site. Work areas and decontamination procedures must be established on the basis of prevailing site conditions.
10. Respirators will be issued for the exclusive use of one worker and will be cleaned and disinfected after each use.
11. Safety gloves and boots shall be taped to the disposable, chemical-protective suits as necessary.
12. All unsafe equipment left unattended will be identified by a "DANGER, DO NOT OPERATE" tag.
13. Noise mufflers or earplugs may be required for all site personnel working around heavy equipment. This requirement will be at the discretion of the Site Health and Safety Officer. Disposable, form-fitting plugs are preferred.

14. Cartridges for air-purifying respirators in use will be changed daily at a minimum.

#### 9.2 Buddy System

Site personnel will employ the buddy system when working under certain circumstances, such as enclosed spacing. Under the buddy system, each site worker is responsible for monitoring the well-being of another worker. No one will work alone when the buddy system is implemented. At no time will fewer than two employees be present at the site if activities are underway.

#### 9.3 Site Communications Plan

Mobile telephone and/or two-way radios will be used to communicate between the work parties on the site. The following standard hand signals will be used in case of failure of radio communication:

- Hands on top of head = Need assistance
- Thumbs up = OK, I am alright, I understand
- Thumbs down = No, negative

Personnel in the Contaminated Zone should remain in constant radio communication or within sight of the project team leader. Any failure of radio communication will require the team leader to evaluate whether personnel should leave the zone.

#### 9.4 Retention of Records

The following records will be maintained on-site and in corporate records for no less than three years.

- Fit test results
- OSHA Training Certification
- Medical Questionnaire and/or Medical Clearance
- Medical Data Sheets
- Accident Report Forms

## 10 Decontamination Plan

### 10.1 General

Personnel involved in work activities at the site may be exposed to compounds in a number of ways, despite the most stringent protective procedures. Site personnel may come in contact with vapors, gases, mists, particulates in the air, or other site media while performing site duties. Use of monitoring instruments and site equipment can also result in exposure and transmittal of hazardous substances.

In general, decontamination involves scrubbing with a detergent water solution followed by clean water rinses. All disposable items shall be disposed of in a dry container. Certain parts of contaminated respirators, such as harness assemblies and leather or cloth components, are difficult to decontaminate. If grossly contaminated, they may have to be discarded. Rubber components can be soaked in detergent and water and scrubbed with a brush. In addition to being contaminated, all respirators, non-disposable protective clothing, and other personal articles must be sanitized or replaced before they can be used again if they become soiled from exhalation, body oils, and perspiration. The manufacturer's instructions should be followed in sanitizing the respirator masks. The Site Health and Safety Officer will be responsible for the proper maintenance, decontamination, and sanitizing of any respirator equipment that may be used on-site. The decontamination zone layout and procedures should match the prescribed levels of personal protection.

The following procedures have been established to provide site personnel with minimum guidelines for proper decontamination. Personnel leaving the point of operations designated as the EZ must follow these minimum procedures. The decontamination process shall take place within the contaminant reduction zone.

### 10.2 Minimum Decontamination Procedure

Personnel leaving the point of operations should remove or change outer gloves. At a minimum, boots shall be cleaned of all accumulated soil/fill. Outer boots must be properly washed where gross contamination is evident or disposed of. If Tyvek suits are being utilized, they should be removed or changed. Personnel should remove the Tyvek suits so that the inner clothing does not come in contact with any contaminated surfaces. After Tyvek removal, personnel shall remove and discard outer Nitrile gloves. Personnel shall then remove the respirator, where applicable. Respirators shall be disinfected between uses with towelettes or other sanitary methods. Potable water, at a minimum, will be present so that site personnel can thoroughly wash hands and face after leaving the point of operations.

The Site Health and Safety Officer will monitor decontamination procedures to ensure their effectiveness. Modifications of the decontamination procedure may be necessary as determined by the Site Health and Safety Officer's observations.

### 10.3 Standard Decontamination Procedure

The following decontamination procedures should be implemented during site operations for the appropriate level of protection.

#### 10.3.1 Level B

<b>Segregated equipment drop</b>	Deposit equipment (tools, sampling devices, notes, monitoring instruments, radios, etc.) used on the site onto plastic drop cloths.
<b>Boot covers and glove wash</b>	Outer boots and outer gloves should be scrubbed with a decontamination solution of detergent and water or replaced.
<b>Rinse off boot covers and gloves</b>	Decontamination solution should be rinsed off boot covers and gloves using generous amounts of water. Repeat as many times as necessary.
<b>Tape removal</b>	Remove tape from around boots and gloves and place into container with plastic liner.
<b>Boot cover removal</b>	Remove disposable boot covers and place into container with plastic liner.
<b>Outer glove removal</b>	Remove outer gloves and deposit in container with plastic liner.
<b>Suit / safety boot wash</b>	Completely wash splash suit, SCBA, gloves, and safety boots. Care should be exercised that no water is allowed into the SCBA regulator. It is suggested that the SCBA regulator be wrapped in plastic.
<b>Suit / safety boot rinse</b>	Thoroughly rinse off all decontamination solution from protective clothing.
<b>Tank or canister changes</b>	This is the last step in the decontamination procedure for those workers wishing to change air tanks and return to the EZ. The worker's air tank or cartridge is exchanged, new outer glove and boot covers are donned, and joints taped.
<b>Removal of safety boots</b>	Remove safety boots and deposit in container with a plastic liner.
<b>SCBA backpack removal</b>	Without removing the face piece, the SCBA backpack should be removed and placed on a table. The face piece should then be disconnected from the remaining SCBA unit and then proceed to the next station.
<b>Splash suit removal</b>	With care, remove the splash suit. The exterior of the splash suit should not come in contact with any inner layers of clothing.
<b>Inner glove wash</b>	The inner gloves should be washed with a mild decontamination solution (detergent / water).
<b>Inner glove rinse</b>	Generously rinse the inner gloves with water.
<b>Face piece removal</b>	Without touching the face with gloves, remove the face piece. The face piece should be deposited into a container that has a plastic liner.
<b>Inner glove removal</b>	Remove the inner glove and deposit into a container that has a plastic liner.
<b>Field wash</b>	Wash hands and face thoroughly. If highly toxic, skin corrosive, or skin absorbent materials are known or suspected to be present, a shower should be taken.

#### 10.3.2 Level C and Level D

The decontamination procedure for Level C and Level D will be satisfied with the Minimum procedures outlined in section 8.2.

### 10.4 Heavy Equipment and Handling Equipment Decontamination

Equipment traversing the site and exiting the site will be subjected to a decontamination protocol. At a minimum the protocol will consist of an inspection of the truck fenders, tires and mud flaps for accumulated soil/fill, and removal of all accumulations using hand tools (brush, broom and scrapers). If deemed necessary by the Health and Safety Officer,

this inspection will be performed over a thirty by fifteen-foot area that has been filled with  $\frac{3}{4}$  inch crushed recycled concrete aggregate to facilitate the removal of soil/fill accumulations from the tires, and to immobilize soil/fill removed from the truck body. Additionally, all trucks hauling waste will be required to be covered prior to exiting the site.

At the conclusion of the use of each piece of excavation equipment on the site, it will be decontaminated with an Alconox / water solution followed by a clean water rinse within the Contaminant Reduction Zone. The rinsate will be allowed to charge into the site ground.

## 11 Emergency Response / Contingency Plan

### 11.1 Pre-Emergency Planning

In order to properly prepare for emergencies, Safety Data Sheets (SDS) will be maintained on-site for the type of contaminants to which workers may be exposed. Based upon the results of previous investigations, The COCs for the Site are

Soil: benzene, toluene, ethylbenzene, total xylenes, n-propylbenzene, 1,3,5-trimethylbenzene, 1,2,4-trimethylbenzene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene, fluoranthene, naphthalene, dibenzofuran, 2-methylphenol, 3-methylphenol/4-methylphenol, arsenic, barium, copper, lead, mercury, nickel and zinc.

Groundwater: benzene, isopropylbenzene, n-propylbenzene and 1,2,4,5-tetramethylbenzene, Arsenic (total), barium (total), chromium (total), iron (total), lead (total), magnesium (total), manganese (total), nickel (total), sodium (total) and thallium (total).

Soil Vapor: TCE.

The MSDS are provided in **Appendix D**.

In the event a suspected or known hazardous substance or substance container is encountered during site activities, a contingency plan will be triggered (see Section 11.3).

### 11.2 Emergency Contact Information

In the event of an accident or emergency situation, emergency procedures will be executed. Said procedures can and will be executed by the first person to observe an accident or emergency situation. The Project Field Manager will be notified about the situation immediately after emergency procedures are implemented.

#### 11.2.1 Emergency Contacts

<i>Emergency:</i>	911	
<i>Hospital:</i>	(718) 780-3000	<b>New York Presbyterian Brooklyn-Methodist hospital</b>
<i>Police:</i>	911	NYPD
<i>Fire Department:</i>	911	NYFD
<i>Chemtrec:</i>	800-424-9300	
<i>NYC Poison Control Center:</i>	212-764-7667	

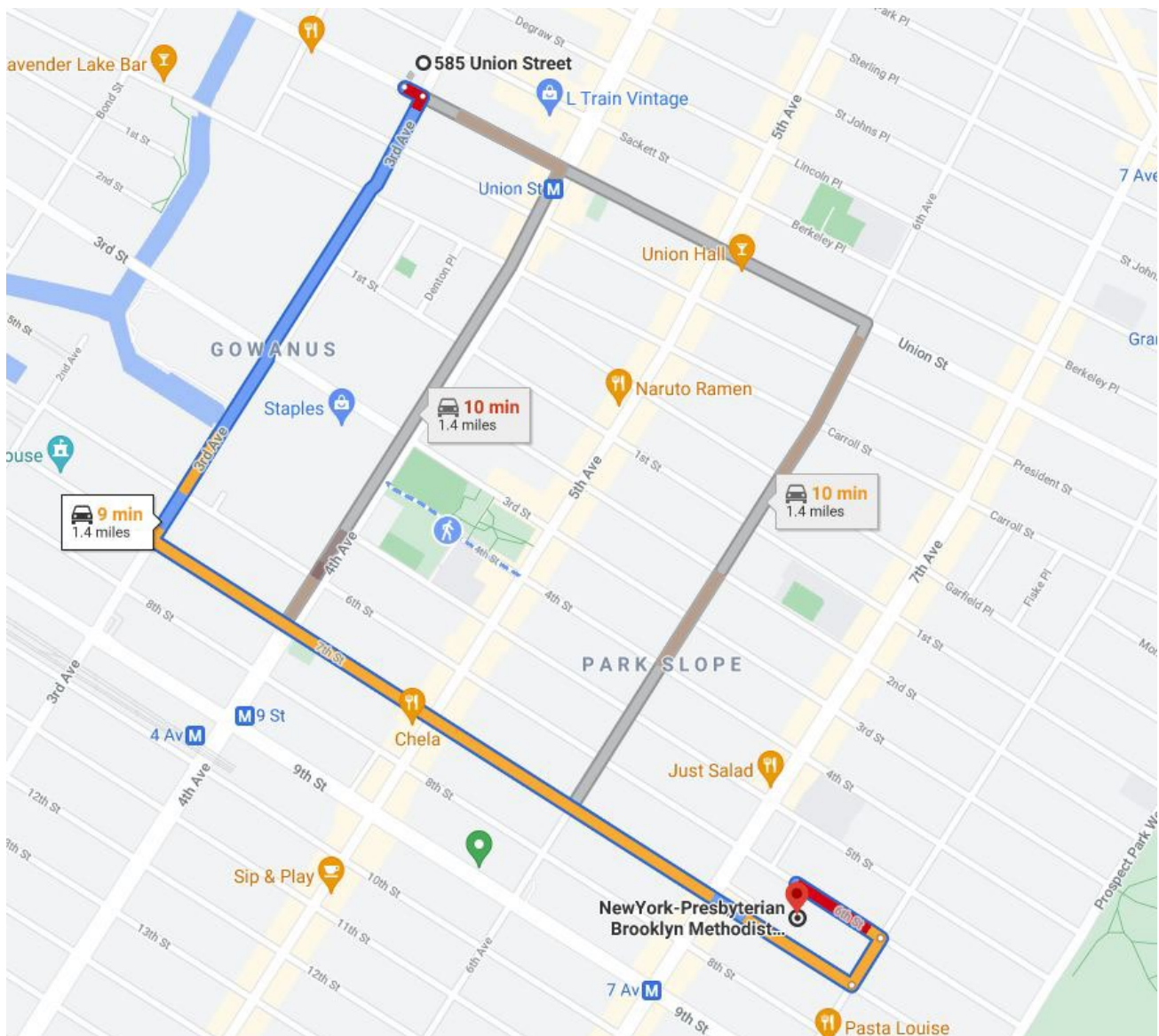
<i>National Response Center:</i>	800-424-8802	
<i>US EPA (24-hour hotline):</i>	800-424-9346	



**Start: 585 Union Street, Brooklyn, NY 11215**

- Head southeast on Union Street toward 3<sup>rd</sup> Avenue – 92 feet
- Turn right at the 1<sup>st</sup> cross street onto 3<sup>rd</sup> Avenue – 0.5 mi
- Turn left onto 7<sup>th</sup> Street – 0.7 mi
- Turn left onto 8<sup>th</sup> Avenue – 259 ft
- Turn left at the 1<sup>st</sup> cross street onto 6<sup>th</sup> Street - 469 ft

**End: New York Presbyterian Brooklyn Methodist Hospital – 506 6<sup>th</sup> Street, Brooklyn, NY 11215**



### 11.2.2 Utility Emergencies / Initiating Subsurface Investigation Work

Where necessary, utility markouts will be called in via the one call center or to the individual entities listed below.

<i>Mark Out One-Call Center (811)</i>	1-800-272-4480	No-Cuts
<i>Gas Company:</i>	718-643-4050	Con Edison
<i>Telephone Company:</i>	516-661-6000	Verizon
<i>Electric Company:</i>	718-643-4050	Con Edison

### 11.3 Contingency / Evacuation Plan

This Section is not, nor does it purport to be, a comprehensive recitation of safety and health requirements applicable to emergency procedures. Rather, contractors, subcontractors and workers at the site must refer to OSHA's Employee Emergency Action Plan Standard, set forth at 29 C.F.R. § 1910 Part 1926.35(a), as well as all supporting OSHA Compliance Directives and Letters of Interpretation, for complete information on safety and health compliance obligations.

If an unknown substance or substance container is encountered during site activities, the following contingency plan will be triggered.

1. The Site Health and Safety Officer, Project Manager and Field Operations Leader will be notified and an Exclusion Zone (the aerial extent of which will be determined by the above safety staff) will be established.
2. All staff will be evacuated from the Exclusion Zone.
3. Air monitoring will be conducted down-wind of the Exclusion Zone.
4. The NYSDEC, as well as any other Government regulatory agency whose need may be prompted by the particular situation, will be notified.
5. Upon arrival of the NYSDEC or Government regulatory agency representative(s), site control will transfer to the appropriate Government personnel.

It may be possible that a situation could develop site emergency could necessitate the evacuation of all personnel from the site. If such a situation develops, an audible alarm shall be given for site evacuation (consisting of an air horn). Personnel shall evacuate the site in a calm and controlled fashion and regroup at a predetermined location. The route of evacuation will be dependent on wind direction, severity, type of incident, etc. The site must not be re-entered until back-up help, monitoring equipment, and/or personal protective equipment are on hand and the appropriate regulatory agencies have been notified.

### 11.4 Emergency Medical Treatment Procedures

This Section is not, nor does it purport to be, a comprehensive recitation of safety and health requirements applicable to medical treatment and first aid. Rather, contractors, subcontractors and workers at the site must refer to OSHA's Medical Services and First Aid Standard, set forth at 29 C.F.R. § 1910 Part 1926.23 and 1926.50, as well as all supporting OSHA

Compliance Directives and Letters of Interpretation, for complete information on safety and health compliance obligations.

All injuries, no matter how slight, will be reported to the site safety supervisor immediately. The safety supervisor will complete an accident report for all incidents (**Appendix E**).

Some injuries, such as severe lacerations or burns, may require immediate treatment. Unless required due to immediate danger, seriously injured persons should not be moved without direction from attending medical personnel.

#### *11.4.1 Standard Procedures for Injury*

1. Notify the Site Health and Safety Officer, Project Manager, and the NYCDEP and NYCDHPD of all accidents, incidents, and near emergency situations.
2. If the injury is minor, trained personnel should proceed to administer appropriate first aid.
3. Telephone for ambulance/medical assistance if necessary. Whenever possible, notify the receiving hospital of the nature of physical injury or chemical overexposure. If no phone is available, transport the person to the nearest hospital. Refer to the map in section 11.2.1.
4. When transporting an injured person to a hospital, bring this Health and Safety Plan with the attached MSDS to assist medical personnel with diagnosis and treatment.

#### *11.4.2 Chemical Overexposure*

In all cases of chemical overexposure, follow standard procedures as outlined below for poison management, first aid, and, if applicable, cardiopulmonary resuscitation. Different routes of exposure and their respective first aid/poison management procedures are outlined below.

<b>Ingestion</b>	Do not induce vomiting unless prompted by a health professional. Transport person to nearest hospital immediately.
<b>Inhalation / Confined Space</b>	Do not enter a confined space to rescue someone who has been overcome unless properly equipped and a standby person present.
<b>Inhalation / Other</b>	Move the person from the contaminated environment. Initiate CPR if necessary. Call or have someone call for medical assistance. Refer to MSDS for additional specific information. If necessary, transport the victim to the nearest hospital as soon as possible.
<b>Skin Contact / Non-Caustic Contaminant (Petroleum, Gasoline, etc.)</b>	Wash off skin with a large amount of water immediately. Remove any affected clothing and rewash skin using soap, if available. Transport person to a medical facility if necessary.

<b>Skin Contact / Corrosive Contaminant (Acids, Hydrogen Peroxide, etc.)</b>	Wash off skin with a large amount of water immediately. Remove any affected clothing and rewash skin with water. Transport person to a medical facility if necessary.
<b>Eyes</b>	Hold eyelids open and rinse the eyes immediately with large amounts of water for 15 minutes. Never permit the eyes to be rubbed. Transport person to a medical facility as soon as possible.

#### *11.4.3 First Aid for Injuries Incurred During Field Work*

A first aid kit and an emergency eyewash will be available on-site. Field crews, when performing field operations, will carry portable first aid kits that include emergency eye wash stations.

#### *11.4.4 First Aid Equipment List*

The first aid kit(s) kept at the site will consist of a weatherproof container with individually sealed packages for each type of item.

The kit will include at least the following items:

- Gauze roller bandages, 1-inch and 2-inch
- Gauze compress bandages, 4-inch
- Gauze pads, 2-inch
- Adhesive tape, 1-inch
- Bandage, 1-inch
- Butterfly bandages
- Triangular bandages, 40-inch
- Ampules of ammonia inhalants
- Antiseptic applicators or swabs
- Burn dressing and sterilized towels
- Surgical scissors
- Eye dressing
- Portable emergency eye wash
- Emergency oxygen supply
- Alcohol
- Hydrogen peroxide
- Clinical grade thermometer
- Tourniquet

#### *11.4.5 Other Emergency Equipment*

One portable fire extinguisher with a rating (ratio) of 20 pound A/B/C and one portable fire extinguisher with a rating of 2A will be conspicuously and centrally located between the restricted and non-restricted zones. In addition, similar extinguishers of the same size and class will be located in the site office trailer so that maximum travel distance to the nearest unit shall not exceed 50 feet. Portable extinguishers will be properly tagged with inspection dates and maintained in accordance with standard maintenance procedures for portable fire extinguishers. Field personnel will be trained in fire extinguisher use before field operations begin.

An emergency at any part of the site, such as fire or chemical release, might require that some appropriately trained site workers direct traffic on or near the site.

The following safety equipment to be used for traffic should be kept readily available on site in the field office:

- reflective/fluorescent vests
- flares
- traffic cones (and flags, or the equivalent, as needed)
- hazard tape (barricades as needed)
- working flashlights

#### 11.5 Record of Injuries Incurred On-Site

##### *11.5.1 Occupational Injuries and Illnesses Form (OSHA 200)*

All occupational injuries and illnesses that are required to be recorded under the Occupational Safety and Health Act will be registered on OSHA Form 200 (see **Appendix C**). The site safety supervisor will record occupational injuries and illnesses within 48 hours of occurrence, as required by statute.

##### *11.5.2 Employer's First Report of Injury*

The site safety supervisor for all accidents involving work injury at the site will complete this form (**Appendix E**). Follow-up procedures will include investigation of each accident or near-miss by the safety supervisor to assure that no similar accidents occur in the future.

**Appendix A:**  
Acknowledgment Statement



**Appendix B:**  
OSHA Respirator Medical Evaluation Questionnaire



**Attachment 4**

**Appendix C to 1910.134:OSHA Respirator Medical Evaluation Questionnaire  
(Mandatory)**

To the employer: Answers to questions in Section 1, and to question 9 in Section 2 of Part A, do not require a medical examination.

To the employee:

Can you read (circle one): Yes No

Your employer must allow you to answer this questionnaire during normal working hours, or at a time and place that is convenient to you. To maintain your confidentiality, your employer or supervisor must not look at or review your answers, and your employer must tell you how to deliver or send this questionnaire to the health care professional who will review it.

**Part A. Section 1. (Mandatory)** The following information must be provided by every employee who has been selected to use any type of respirator (please print).

1. Today's date: \_\_\_\_\_

2. Your name: \_\_\_\_\_

3. Your age (to nearest year): \_\_\_\_\_

4. Sex (circle one): Male Female

5. Your height: \_\_\_\_\_ ft. \_\_\_\_\_ in.

6. Your weight: \_\_\_\_\_ lbs.

7. Your job title: \_\_\_\_\_

8. A phone number where you can be reached by the health care professional who reviews this questionnaire (include the Area Code): \_\_\_\_\_

9. The best time to phone you at this number: \_\_\_\_\_

10. Has your employer told you how to contact the health care professional who will review this questionnaire (circle one): ..... Yes No

11. Check the type of respirator you will use (you can check more than one category):

a. \_\_\_\_\_ N, R, or P disposable respirator (filter-mask, non-cartridge type only).

b. \_\_\_\_\_ Other type (for example, half- or full-facepiece type, powered-air purifying, supplied-air, self-contained breathing apparatus).

12. Have you worn a respirator (circle one): ..... Yes No

If "yes," what type(s): \_\_\_\_\_

\_\_\_\_\_

**Part A. Section 2. (Mandatory)** Questions 1 through 9 below must be answered by every employee who has been

selected to use any type of respirator (please circle "yes" or "no").

1. Do you currently smoke tobacco, or have you smoked tobacco in the last month: . . . . . Yes  
No

2. Have you ever had any of the following conditions?

- a. Seizures (fits): . . . . . Yes No
- b. Diabetes (sugar disease): . . . . . Yes No
- c. Allergic reactions that interfere with your breathing: . . . . . Yes No
- d. Claustrophobia (fear of closed-in places): . . . . . Yes No
- e. Trouble smelling odors (except when you had a cold): . . . . . Yes No

3. Have you ever had any of the following pulmonary or lung problems?

- a. Asbestosis: . . . . . Yes No
- b. Asthma: . . . . . Yes No
- c. Chronic bronchitis: . . . . . Yes No
- d. Emphysema: . . . . . Yes No
- e. Pneumonia: . . . . . Yes No
- f. Tuberculosis: . . . . . Yes No
- g. Silicosis: . . . . . Yes No
- h. Pneumothorax (collapsed lung): . . . . . Yes No
- i. Lung cancer: . . . . . Yes No
- j. Broken ribs: . . . . . Yes No
- k. Any chest injuries or surgeries: . . . . . Yes No
- l. Any other lung problem that you've been told about: . . . . . Yes No

4. Do you currently have any of the following symptoms of pulmonary or lung illness?

- a. Shortness of breath: . . . . . Yes No
- b. Shortness of breath when walking fast on level ground or walking up a slight hill or incline: Yes No
- c. Shortness of breath when walking with other people at an ordinary pace on level ground: . . Yes No
- d. Have to stop for breath when walking at your own pace on level ground: . . . . . Yes No
- e. Shortness of breath when washing or dressing yourself: . . . . . Yes No
- f. Shortness of breath that interferes with your job: . . . . . Yes No
- g. Coughing that produces phlegm (thick sputum): . . . . . Yes No
- h. Coughing that wakes you early in the morning: . . . . . Yes No
- i. Coughing that occurs mostly when you are lying down: . . . . . Yes No
- j. Coughing up blood in the last month: . . . . . Yes No
- k. Wheezing: . . . . . Yes No
- l. Wheezing that interferes with your job: . . . . . Yes No
- m. Chest pain when you breathe deeply: . . . . . Yes No
- n. Any other symptoms that you think may be related to lung problems: . . . . . Yes No

5. Have you ever had any of the following cardiovascular or heart problems?

- a. Heart attack: . . . . . Yes No
- b. Stroke: . . . . . Yes No
- c. Angina: . . . . . Yes No
- d. Heart failure: . . . . . Yes No
- e. Swelling in your legs or feet (not caused by walking): . . . . . Yes No
- f. Heart arrhythmia (heart beating irregularly): . . . . . Yes No
- g. High blood pressure: . . . . . Yes No
- h. Any other heart problem that you've been told about: . . . . . Yes No

6. Have you ever had any of the following cardiovascular or heart symptoms?
- a. Frequent pain or tightness in your chest: . . . . . Yes No
  - b. Pain or tightness in your chest during physical activity: . . . . . Yes No
  - c. Pain or tightness in your chest that interferes with your job: . . . . . Yes No
  - d. In the past two years, have you noticed your heart skipping or missing a beat: . . . . . Yes No
  - e. Heartburn or indigestion that is not related to eating: . . . . . Yes No
  - f. Any other symptoms that you think may be related to heart or circulation problems: . . . . . Yes No
7. Do you currently take medication for any of the following problems?
- a. Breathing or lung problems: . . . . . Yes No
  - b. Heart trouble: . . . . . Yes No
  - c. Blood pressure: . . . . . Yes No
  - d. Seizures (fits): . . . . . Yes No
8. Has your wearing a respirator caused any of the following problems? (If you've never used a respirator, check the following space \_\_\_ and go to question 9:)
- a. Eye irritation: . . . . . Yes No
  - b. Skin allergies or rashes: . . . . . Yes No
  - c. Anxiety that occurs only when you use the respirator: . . . . . Yes No
  - d. Unusual weakness or fatigue: . . . . . Yes No
  - e. Any other problem that interferes with your use of a respirator: . . . . . Yes No
9. Would you like to talk to the health care professional who will review this questionnaire about your answers to this questionnaire: . . . . . Yes No
- Questions 10 to 15 below must be answered by every employee who has been selected to use either a full-facepiece respirator or a self-contained breathing apparatus (SCBA). For employees who have been selected to use other types of respirators, answering these questions is voluntary.**
10. Have you ever lost vision in either eye (temporarily or permanently): . . . . . Yes No
11. Do you currently have any of the following vision problems?
- a. Wear contact lenses: . . . . . Yes No
  - b. Wear glasses: . . . . . Yes No
  - c. Color blind: . . . . . Yes No
  - d. Any other eye or vision problem: . . . . . Yes No
12. Have you ever had an injury to your ears, including a broken ear drum: . . . . . Yes No
13. Do you currently have any of the following hearing problems?
- a. Difficulty hearing: . . . . . Yes No
  - b. Wear a hearing aid: . . . . . Yes No
  - c. Any other hearing or ear problem: . . . . . Yes No
14. Have you ever had a back injury: . . . . . Yes No
15. Do you currently have any of the following musculoskeletal problems?
- a. Weakness in any of your arms, hands, legs, or feet: . . . . . Yes No
  - b. Back pain: . . . . . Yes No
  - c. Difficulty fully moving your arms and legs: . . . . . Yes No
  - d. Pain or stiffness when you lean forward or backward at the waist: . . . . . Yes No
  - e. Difficulty fully moving your head up or down: . . . . . Yes No
  - f. Difficulty fully moving your head side to side: . . . . . Yes No
  - g. Difficulty bending at your knees: . . . . . Yes No
  - h. Difficulty squatting to the ground: . . . . . Yes No

- i. Difficulty climbing a flight of stairs or a ladder carrying more than 25 lbs: . . . . . Yes No
- j. Any other muscle or skeletal problem that interferes with using a respirator: . . . . . Yes No

**Part B Any of the following questions, and other questions not listed, may be added to the questionnaire at**

**the discretion of the health care professional who will review the questionnaire.**

1. In your present job, are you working at high altitudes (over 5,000 feet) or in a place that has lower than normal

amounts of oxygen: . . . . . Yes No

If "yes," do you have feelings of dizziness, shortness of breath, pounding in your chest, or other symptoms when you're working under these conditions: . . . . . Yes

No

2. At work or at home, have you ever been exposed to hazardous solvents, hazardous airborne chemicals (e.g.,

gases, fumes, or dust), or have you come into skin contact with hazardous chemicals: . . . . . Yes

No

If "yes," name the chemicals if you know them: \_\_\_\_\_

\_\_\_\_\_

3. Have you ever worked with any of the materials, or under any of the conditions, listed below:

a. Asbestos: . . . . . Yes No

b. Silica (e.g., in sandblasting): . . . . . Yes No

c. Tungsten/cobalt (e.g., grinding or welding this material): . . . . . Yes No

d. Beryllium: . . . . . Yes No

e. Aluminum: . . . . . Yes No

f. Coal (for example, mining): . . . . . Yes No

g. Iron: . . . . . Yes No

h. Tin: . . . . . Yes No

i. Dusty environments: . . . . . Yes No

j. Any other hazardous exposures: . . . . . Yes No

If "yes," describe these

exposures: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

4. List any second jobs or side businesses you

have: \_\_\_\_\_

\_\_\_\_\_

5. List your previous

occupations: \_\_\_\_\_

\_\_\_\_\_

6. List your current and previous

hobbies: \_\_\_\_\_

\_\_\_\_\_

7. Have you been in the military services? . . . . . Yes No

If "yes," were you exposed to biological or chemical agents (either in training or combat): . . . . . Yes

No

8. Have you ever worked on a HAZMAT team? . . . . . Yes

No

9. Other than medications for breathing and lung problems, heart trouble, blood pressure, and seizures mentioned earlier in this questionnaire, are you taking any other medications for any reason (including over-the-counter medications): . . . . . Yes No

If "yes," name the medications if you know them: \_\_\_\_\_

10. Will you be using any of the following items with your respirator(s)?

a. HEPA Filters: . . . . . Yes No

b. Canisters (for example, gas masks): . . . . . Yes No

c. Cartridges: . . . . . Yes No

11. How often are you expected to use the respirator(s) (circle "yes" or "no" for all answers that apply to you)?:

a. Escape only (no rescue): . . . . . Yes No

b. Emergency rescue only: . . . . . Yes No

c. Less than 5 hours per week: . . . . . Yes No

d. Less than 2 hours per day: . . . . . Yes No

e. 2 to 4 hours per day: . . . . . Yes No

f. Over 4 hours per day: . . . . . Yes No

12. During the period you are using the respirator(s), is your work effort:

a. Light (less than 200 kcal per hour): . . . . . Yes No

If "yes," how long does this period last during the average shift: \_\_\_\_\_ hrs. \_\_\_\_\_ mins.

Examples of a light work effort are sitting while writing, typing, drafting, or performing light assembly work; or

standing while operating a drill press (1-3 lbs.) or controlling machines.

b. Moderate (200 to 350 kcal per hour): . . . . . Yes No

If "yes," how long does this period last during the average shift: \_\_\_\_\_ hrs. \_\_\_\_\_ mins.

Examples of moderate work effort are sitting while nailing or filing; driving a truck or bus in urban traffic; standing while drilling, nailing, performing assembly work, or transferring a moderate load (about 35 lbs.) at

trunk level; walking on a level surface about 2 mph or down a 5-degree grade about 3 mph; or pushing a wheelbarrow with a heavy load (about 100 lbs.) on a level surface.

c. Heavy (above 350 kcal per hour): . . . . . Yes No

If "yes," how long does this period last during the average shift: \_\_\_\_\_ hrs. \_\_\_\_\_ mins.

Examples of heavy work are lifting a heavy load (about 50 lbs.) from the floor to your waist or shoulder; working

on a loading dock; shoveling; standing while bricklaying or chipping castings; walking up an 8-degree grade

about 2 mph; climbing stairs with a heavy load (about 50 lbs.).

13. Will you be wearing protective clothing and or equipment (other than the respirator) when you're using your

respirator: . . . . . Yes No

If "yes," describe this protective clothing and or equipment: \_\_\_\_\_

14. Will you be working under hot conditions (temperature exceeding 77 deg. F): . . . . . Yes No

15. Will you be working under humid conditions: . . . . . Yes No

16. Describe the work you'll be doing while you're using your respirator(s):

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17. Describe any special or hazardous conditions you might encounter when you're using your respirator(s) (for example, confined spaces, life-threatening gases):

---

---

18. Provide the following information, if you know it, for each toxic substance that you'll be exposed to when you're using your respirator(s):

Name of the first toxic substance: \_\_\_\_\_

Estimated maximum exposure level per shift: \_\_\_\_\_

Duration of exposure per shift: \_\_\_\_\_

Name of the second toxic substance: \_\_\_\_\_

Estimated maximum exposure level per shift: \_\_\_\_\_

Duration of exposure per shift: \_\_\_\_\_

Name of the third toxic substance: \_\_\_\_\_

Estimated maximum exposure level per shift: \_\_\_\_\_

Duration of exposure per shift: \_\_\_\_\_

The name of any other toxic substances that you'll be exposed to while using your respirator:

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19. Describe any special responsibilities you'll have while using your respirator(s) that may affect the safety and well-being of others (for example, rescue, security):

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**Apéndice C: Cuestionario de Evaluación Médico obligado por la OSHA  
(La agencia de seguridad y salud ocupacional)**

**Parte 29 CFR 1910.134 Mandatorio para Protección del Sistema Respiratorio**

Marque con un círculo para indicar sus respuestas a cada pregunta.

Para el empleado: Puede usted leer (circule uno): Sí o No

Su patrón debe dejarlo responder estas preguntas durante horas de trabajo o en un tiempo y lugar que sea conveniente para usted. Para mantener este cuestionario confidencial, su patrón o supervisor no debe ver o revisar sus respuestas. Su patrón debe informarle a quien dar o enviar este cuestionario para ser revisado por un profesional de sanidad con licencia autorizado por el estado.

**Parte A. Sección 1. (Mandatorio).** La siguiente información debe de ser proveida por cada empleado que ha

sido seleccionado para usar cualquier tipo de respirador (escriba claro por favor).

1. Fecha : \_\_\_\_\_
2. Nombre: \_\_\_\_\_
3. Edad: \_\_\_\_\_
4. Su sexo (circule uno) Masculino o Femenino
5. Altura: \_\_\_\_\_ pies \_\_\_\_\_ pulgadas
6. Peso: \_\_\_\_\_ libras
7. Su ocupación, título o tipo de trabajo: \_\_\_\_\_
8. Número de teléfono al donde pueda ser llamado por un profesional de sanidad con licencia que revisara este cuestionario (incluya el área): \_\_\_\_\_
9. Indique la hora mas conveniente para llamarle a este numero: \_\_\_\_\_
10. ¿Le ha informado su patrón como comunicarse con el profesional de sanidad con licencia que va a revisar este cuestionario (circule una respuesta)? . . . . . Sí o No
11. Anote el tipo de equipo protector respiratorio que va utilizar (puede anotar mas de una categoría)
  - a. \_\_\_\_\_ Respirador disponible de clase N, R, o P (por ejemplo: respirador de filtro mecánico, respirador sin cartucho)
  - b. \_\_\_\_\_ Otros tipos (respirador con cartucho químico, máscara con cartucho químico, máscara con manguera con soplador (PAPR), máscara con manguera sin soplador (SAR), aparato respiratorio autónomos (SCBA)).
12. ¿Ha usado algun tipo de respirador ? . . . . . Sí o No

Si ha usado equipo protector respiratorio, que tipo(s) ha utilizado:  
\_\_\_\_\_  
\_\_\_\_\_

**Parte A. Seccion 2. (Mandatorio):** Preguntas del 1 al 9 deben ser contestadas por cada empleado que fue seleccionado a usar cualquier tipo de respirador. Marque con un circulo para indicar sus respuestas.

1. ¿Corrientemente fuma tabaco, o ha fumado tabaco durante el ultimo mes? . . . . . Sí o No

2. ¿Ha tenido algunas de las siguientes condiciones medicas?

a. Convulsiones : . . . . . Sí o No

b. Diabetes (azucar en la sangre): . . . . . Sí o No

c. Reacciones alergicas que no lo deja respirar: . . . . . Sí o No

d. Claustrofobia (miedo de estar en espacios cerrados): . . . . . Sí o No

e. Dificultad oliendo excepto cuando ha cogido un resfriado: . . . . . Sí o No

3. ¿Ha tenido algunas de los siguientes problemas pulmonares?

a. Asbestosis: . . . . . Sí o No

b. Asma: . . . . . Sí o No

c. Bronquitis cronica: . . . . . Sí o No

d. Emfisema: . . . . . Sí o No

e. Pulmonía: . . . . . Sí o No

f. Tuberculosis: . . . . . Sí o No

g. Silicosis: . . . . . Sí o No

h. Neumotorax (pulmon colapsado): . . . . . Sí o No

i. Cáncer en los pulmones: . . . . . Sí o No

j. Costillas quebradas: . . . . . Sí o No

k. Injuria o cirujía en el pecho: . . . . . Sí o No

l. Algun otro problema de los pulmones que le ha dicho su medico: . . . . . Sí o No

4. ¿Corrientemente tiene alguno de los siguientes síntomas o enfermedades en sus pulmones?

a. Respiración dificultosa . . . . . Sí o No

b. Respiración dificultosa cuando camina rapido sobre terreno plano o subiendo una colina: Sí o No

c. Respiración dificultosa cuando camina normalmente con otras personas sobre terreno plano: Sí o No

d. Cuando camina normalmente en terreno plano se encuentra corto de resuello? . . . . . Sí o No

e. Respiración dificultosa cuando se esta bañando o vistiendo: . . . . . Sí o No

f. Respiración dificultosa que lo impede trabajar: . . . . . Sí o No

g. Tos con flema: . . . . . Sí o No

h. Tos que lo despierta temprano en la mañana: . . . . . Sí o No

i. Tos que ocurre cuando esta acostado: . . . . . Sí o No

j. Ha tosido sangre en el ultimo mes: . . . . . Sí o No

k. Silbar o respirar con mucha dificultad: . . . . . Sí o No

l. Silbar que lo impede trabajar: . . . . . Sí o No

m. Dolor del pecho cuando respira profundamente: . . . . . Sí o No

n. Otros síntomas que crea usted estar relacionados a los pulmones: . . . . . Sí o No

5. ¿Ha tenido algunos de los siguientes problemas con el corazón?

a. Ataque cardiaco: . . . . . Sí o No

b. Ataque cerebrovascular: . . . . . Sí o No

c. Dolor en el pecho: . . . . . Sí o No

d. Falla de corazón: . . . . . Sí o No

e. Hinchazón en las piernas o pies (que no sea por caminar): . . . . . Sí o No

f. Latidos irregulares del corazón: . . . . . Sí o No

g. Alta presión: . . . . . Sí o No

h. Algun otro problema cardio-vascular o cardiaco: . . . . . Sí o No

6. ¿Ha tenido algunos de los siguientes síntomas causados por su corazón?

a. Dolor de pecho frecuente o pecho apretado: . . . . . Sí o No

b. Dolor o pecho apretado durante actividad fisica: . . . . . Sí o No



- c. Dolor o pecho apretado que no lo deja trabajar normalmente: . . . . . Sí o No
- d. En los últimos dos años ha notado que su corazón late irregularmente: . . . . . Sí o No
- e. Dolor en el pecho o indigestión que no es relacionado a la comida: . . . . . Sí o No
- f. Algunos otros síntomas que usted piensa ser causado por problemas de su corazón o de su circulación. . . . . Sí o No

7. ¿Esta tomando medicina por alguno de los siguientes problemas?

- a. Respiración dificultosa: . . . . . Sí o No
- b. Problemas del corazón: . . . . . Sí o No
- c. Alta presión : . . . . . Sí o No
- d. Convulsiones: . . . . . Sí o No

8. ¿Le ha causado alguno de los siguientes problemas usando el respirador? (si no ha usado un respirador, deje

esta pregunta en blanco\_\_ y continúe con pregunta 9).

- a. Irritación de los ojos: . . . . . Sí o No
- b. Alergias del cutis o sarpullido: . . . . . Sí o No
- c. Ansiedad que ocurre solamente cuando usa el respirador: . . . . . Sí o No
- d. Debilidad, falta de vigor o fatiga des acostumbrada: . . . . . Sí o No
- e. Algun otro problema que le impida utilizar su respirador: . . . . . Sí o No

9. ¿Le gustaría hablar con el profesional de sanidad con licencia autorizado por el estado que revisara este cuestionario sobre sus respuestas? . . . . . Sí o No

**Las preguntas del 10 al 15 deben ser contestadas por los empleados seleccionados para usar una máscara con cartucho químico o aparato respiratorio autónomo (SCBA). Los empleados que usan otro tipo de respirador no tienen que contestar estas preguntas.**

10. ¿Ha perdido la vista en cualquiera de sus ojos (temporalmente o permanente): . . . . . Sí o No

11. ¿Corrientemente tiene algunos de los siguientes problemas con su vista?

- a. Usa lentes de contacto: . . . . . Sí o No
- b. Usa lentes: . . . . . Sí o No
- c. Daltoniano (dificultad distinguiendo colores): . . . . . Sí o No
- d. Tiene algún problema con sus ojos o su vista: . . . . . Sí o No

12. ¿Ha tenido daño en sus oídos incluyendo rotura del tímpano: . . . . . Sí o No

13. ¿Corrientemente tiene uno de las siguientes problemas para oír?

- a. Dificultad oyendo: . . . . . Sí o No
- b. Usa un aparato para oír: . . . . . Sí o No
- c. Tiene algun otro problema con sus oídos o dificultad escuchando: . . . . . Sí o No

14. ¿Se ha dañado o lastimado su espalda? . . . . . Sí o No

15. ¿Tiene uno de los siguientes problemas de su aparato muscular or esqueleto?

- a. Debilidad en sus brazos, manos, piernas o pies : . . . . . Sí o No
- b. Dolor de espalda: . . . . . Sí o No
- c. Dificultad para mover sus brazos y piernas completamente: . . . . . Sí o No
- d. Dolor o engarrotamiento cuando se inclina para adelante o para atrás: . . . . . Sí o No
- e. Dificultad para mover su cabeza para arriba o para abajo completamente: . . . . . Sí o No
- f. Dificultad para mover su cabeza de lado a lado: . . . . . Sí o No
- g. Dificultad para agacharse doblando sus rodillas: . . . . . Sí o No
- h. Dificultad para agacharse hasta tocar el piso: . . . . . Sí o No
- i. Dificultad subiendo escaleras cargando mas de 25 libras: . . . . . Sí o No
- j. Alguno problema muscular o con sus huesos que le evite usar un respirador: . . . . . Sí o No

**Parte B - Las siguientes preguntas pueden ser agregadas al cuestionario a discrecion del profesional de sanidad con licencia autorizado por el estado.**

1. ¿Esta trabajando en las alturas arriba de 5,000 pies o en sitios que tienen menos oxígeno de lo normal? ..... Sí o No  
Si la respuesta es “Sí”, se ha sentido mareado, o ha tenido dificultad respirando, palpitaciones, o cualquier otro síntoma que usted no tiene cuando no está trabajando bajo estas condiciones: ..... Sí o No

2. ¿En el trabajo o en su casa, ha estado expuesto a solventes o contaminantes peligrosos en el aire (por ejemplo, humos, neblina o polvos) o ha tenido contacto del cutis con químicas peligrosas? ..... Sí o No

Escriba las químicas y productos con las que ha estado expuesto, si sabe cuales son: \_\_\_\_\_

3. ¿Ha trabajado con los siguientes materiales o las condiciones anotadas abajo?:

- a. Asbestos: ..... Sí o No
- b. Sílice (Limpiar mediante un chorro de arena): ..... Sí o No
- c. Tungsteno/Cobalto (pulverizar o soldadura): ..... Sí o No
- d. Berilio: ..... Sí o No
- e. Aluminio: ..... Sí o No
- f. Carbón de piedra (minando): ..... Sí o No
- g. Hierro: ..... Sí o No
- h. Estaño: ..... Sí o No
- i. Ambiente polvoriento: ..... Sí o No
- j. Otra exposicion peligrosa: ..... Sí o No

Describe las exposiciones peligrosas: \_\_\_\_\_

4. ¿Tiene usted otro trabajo o un negocio aparte de este? \_\_\_\_\_

5. Apunte su previos trabajos: \_\_\_\_\_

6. Apunte sus pasatiempos: \_\_\_\_\_

7. ¿Tiene servicio militar? ..... Sí o No

Si la respuesta es “Sí”, ha estado expuesto a agentes químicos o biológicos durante entrenamiento o combate: ..... Sí o No

8. ¿Alguna vez ha trabajado en un equipo de HAZMAT (equipo respondedor a incidentes de materiales peligrosos con emergencia)? ..... Sí o No

9. ¿Esta tomando alguna medicina que no haya mencionado en este cuestionario (incluyendo remedios caseros o medicinas que compra sin receta)? ..... Sí o No

Si la respuesta es "Sí", cuales son \_\_\_\_\_

10. ¿Va a usar algunas de las siguientes partes con su respirador?

a. filtros HEPA (filtro de alta eficiencia que remueve partículas tóxicas en la atmósfera): . . . . Sí o No

b. Canastillo (por ejemplo, máscara para gas): . . . . . Sí o No

c. Cartuchos: . . . . . Sí o No

11. ¿Cuántas veces espera usar un respirador?

a. Para salir de peligro solamente (no rescates): . . . . . Sí o No

b. Recates de emergencia solamente: . . . . . Sí o No

c. Menos de 5 horas *por semana*: . . . . . Sí o No

d. Menos de 2 horas *por día*: . . . . . Sí o No

e. 2 a 4 horas *por día*: . . . . . Sí o No

f. Mas de 4 horas *por día*: . . . . . Sí o No

12. ¿Durante el tiempo de usar el respirador, su trabajo es...?

a. **Ligero** (menos de 200 kcal por hora): . . . . . Sí o No

Si la respuesta es "sí", cuanto tiempo dura la obra \_\_\_\_\_ horas \_\_\_\_\_ minutos

Ejemplos de trabajos ligeros: estar sentado escribiendo, escribiendo a máquina, diseñando, trabajando la línea de

montaje, o estar parado gobernando un taladro o máquinas:

b. **Moderado** (200-350 kcal por hora ): . . . . . Sí o No

Si la respuesta es "sí" cuanto tiempo dura en promedio por jornada \_\_\_\_\_ horas \_\_\_\_\_ minutos

Ejemplos de trabajos moderados : sentado clavando o archivando; manejando un camión o autobús en trafico

pesado; estar de pie taladrando, clavando, trabajando la línea de montaje, o transfiriendo una carga (de 35 libras)

a la altura de la cintura; caminando sobre tierra plana a 2 millas por hora o bajando a 3 millas por hora; empujando una carretilla con una carga pesada (de 100 libras) sobre terreno plano.

c. **Pesado** (mas de 350 kcal por hora): . . . . . Sí o No

Si la respuesta es "sí" cuanto tiempo dura en promedio por jornada \_\_\_\_\_ horas \_\_\_\_\_ minutos

Ejemplos de trabajos pesados: levantando cargas pesadas (mas de 50 libras) desde el piso hasta la altura de la

cintura o los hombros; trabajando cargando o descargando; transpalear; estar de pie trabajando de albañil o demenuzando moldes; subiendo a 2 millas por hora; subiendo la escalera con una carga pesada (mas de 50 libras).

13. ¿Va a estar usando ropa o equipo protectivo cuando use el respirador? . . . . . Sí o No

Si la respuesta es "sí" describa que va a estar usando \_\_\_\_\_

14. ¿Va a estar trabajando en condiciones calurosas (temperatura mas de 77 grados F)? . . . . . Sí o No

15. ¿Va a estar trabajando en condiciones húmedas? . . . . . Sí o No

16. Describa el tipo de trabajo que va a estar usted haciendo cuando use el respirador.

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17. Describa cualquier situación especial o peligrosa que pueda encontrar cuando este usando el respirador (por ejemplo, espacios encerrados, gases que lo puedan matar, etc.)

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18. Provea la siguiente información si la sabe, por cada sustancia tóxica que usted va a estar expuesto cuando

este usando el respirador(s):

Nombre de la primera sustancia tóxica \_\_\_\_\_

Máximo nivel de exposición por jornada de trabajo \_\_\_\_\_

Tiempo de exposición por jornada \_\_\_\_\_

Nombre de la segunda sustancia tóxica \_\_\_\_\_

Máximo nivel de exposición por jornada de trabajo \_\_\_\_\_

Tiempo de exposición por jornada \_\_\_\_\_

Nombre de la tercera sustancia tóxica \_\_\_\_\_

Máximo nivel de exposición por jornada de trabajo \_\_\_\_\_

Tiempo de exposición por jornada \_\_\_\_\_

El nombre de cualquier sustancia tóxica que usted va a estar expuesto cuando este usted usando el respirador \_\_\_\_\_

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19. Describa alguna responsabilidad especial que usted va a tener cuando usted este usado el respirador(s) que pueda afectar la seguridad o la vida de otros ( por ejemplo, rescate, seguridad).

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**Appendix C:**  
OSHA Form 200-Occupational Injuries & Illnesses

Log and Summary of Occupational Injuries and illnesses					
<b>NOTE:</b>		This form is required by Public Law 91-596 and must be kept in the establishment for 5 years. Failure to maintain and post can result in issuance of citations and assessment of penalties. (See posting requirements on the other side of form)		<b>RECORDABLE CASES:</b> You are required to record information about every occupational death; every nonfatal occupational illness; and those nonfatal occupational injuries which involve one or more of the following: loss of consciousness, restriction of work or motion, transfer to another job, or medical treatment (other than first aid) (See definitions on the other side of form)	
Case or File Number	Date of Injury or Onset of Illness	Employee's Name	Occupation	Department	Description of Injury or Illness
Enter a nonduplicating number which will facilitate comparisons with supplementary records.	Enter Mo/Day	Enter first name or initial, middle initial, last name	Enter regular job title, not activity employee was performing when injury occurred or at onset of illness. In the absence of a formal title, enter a brief description of the employee's duties.	Enter department in which the employee is regularly employed or a description of normal workplace to which employee is assigned, even though temporarily working in another department at the time of injury or illness.	Enter a brief description of the injury or illness and indicate the part or parts of the body affected.  Typical entries for this column might be: Amputation of 1st joint right forefinger; Strain of lower back; Contact dermatitis on both hands; Electrocutation - body.
(A)	(B)	(C)	(D)	(E)	(F)
					PREVIOUS PAGE TOTALS =>
					TOTALS (Instructions on other side of form) =>
OSHA No. 200					



Company Name	Form Approved
Establishment Name	O.M.B. No. 1218-0176
Establishment Address	See OMB Disclosure
	Statement on reverse.

Extent of and Outcome of Injury						Type, Extent of, and Outcome of Illness												
Fatalities	Nonfatal Injuries					Type of Illness							Fatalities	Nonfatal Illnesses				Illnesses without Lost Workdays
Injury Related	Injuries with Lost Workdays				Injuries Without Lost Workdays	CHECK Only One Column for Each Illness (See other side of form for terminations or permanent transfers)							Illness Related	Illnesses with Lost Workdays				Illnesses without Lost Workdays
Enter Date of death. mm/dd/yy	Enter a Check if injury involves DAYS away from work or restricted work activity or both.	Enter a Check if injury involves DAYS away from work.	Enter number of DAYS away from work	Enter number of DAYS of restricted work activity	Enter a Check if no entry was made in column 1 or 2 but the injury is recordable as defined above.	Occupational Skin Disorder or Disease	Dust Disease of the lungs	Respiratory Conditions due to toxic agents	Poisoning (systemic effects of toxic materials)	Disorders due to physical agents	Disorders associated with repeated trauma	All other occupational illnesses	Enter DATE of death, mm/dd/yy	Enter a CHECK if Illness involves DAYS away from work, or DAYS of restricted work activity or both.	Enter a CHECK if Illness involves DAYS away from work.	Enter number of DAYS away from work.	Enter number of DAYS of restricted work activity	Enter a CHECK if no entry was made in columns 8 or 9
(1)	(2)	(3)	(4)	(5)	(6)	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(8)	(9)	(10)	(11)	(12)	(13)

Certification of Annual Summary Totals by: \_\_\_\_\_ Title: \_\_\_\_\_ Date: \_\_\_\_\_

## OMB DISCLOSURE STATEMENT

Public reporting burden for this collection of information is estimated to vary from 4 to 30 (time in minutes) per response with an average of 15 (time in minutes) per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments regarding this estimate or any other aspect of this information collection, including suggestions for reducing this burden, please send them to the OSHA Office of Statistics, Room N-3644, 200 Constitution Avenue, N.W. Washington, D.C. 20210

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### Instructions for OSHA No. 200

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#### I. Log and Summary of Occupational Injuries and Illnesses

Each employer who is subject to the recordkeeping requirements of the Occupational Safety and Health Act of 1970 must maintain for each establishment, a log of all recordable occupational injuries and illnesses. This form (OSHA No. 200) may be used for that purpose. A substitute for the OSHA No. 200 is acceptable if it is as detailed, easily readable, and understandable as the OSHA No. 200.

Enter each recordable case on the log within six (6) workdays after learning of its occurrence. Although other records must be maintained at the establishment to which they refer, it is possible to prepare and maintain the log at another location, using data processing equipment if desired. If the log is prepared elsewhere, a copy updated to within 45 calendar days must be present at all times in the establishment.

Logs must be maintained and retained for five (5) years following the end of the calendar year to which they relate. Logs must be available (normally at the establishment) for inspection and copying by representatives of the Department of Labor, or the Department of Health and Human Services, or States accorded jurisdiction under the Act. Access to the log is also provided to employees, former employees and their representatives.

#### II. Changes in Extent of or Outcome of Injury or Illness

If, during the 5-year period the log must be retained, there is a change in an extent and outcome of an injury or illness which affects entries in columns 1, 2, 6, 8, 9, or 13, the first entry should be lined out and a new entry made. For example, if an injured employee at first required only medical treatment but later lost workdays away from work, the check in column 6 should be lined out and checks entered in columns 2 and 3 and the number of lost workdays entered in column 4.

In another example, if an employee with an occupational illness lost workdays, returned to work, and then died of the illness, any entries in columns 9 through 12 would be lined out and the date of death entered in column 8.

The entire entry for an injury or illness should be lined out if later found to be nonrecordable. For example, an injury which is later determined not to be work related, or which was initially thought to involve medical treatment but later was determined to have involved only first aid.

#### III. Posting Requirements

A copy of the totals and information following the total line of the last page for the year, must be posted at each establishment in the place or places where notices to employees are customarily posted. This copy must be posted no later than February 1 and must remain in place until March 1. Even though there were no injuries or illnesses during the year, zeros must be entered on the totals line, and the form posted.

The person responsible for the annual summary totals shall certify that the totals are true and complete by signing at the bottom of the form.

#### IV. Instructions for Completing Log and Summary of Occupational injuries and illnesses

##### Column A - CASE OR FILE NUMBER. Self Explanatory

##### Column B - DATE OF INJURY OR ONSET OF ILLNESS

For occupational injuries, enter the date of the work accident which resulted in the injury. For occupational illnesses, enter the date of initial diagnosis of illness, or, if absence from work occurred before diagnosis, enter the first day of the absence attributable to the illness which was later diagnosed or recognized.

##### Columns C through F - Self Explanatory

##### Columns 1 and 8 - INJURY OR ILLNESS-RELATED DEATHS - Self Explanatory

##### Columns 2 and 9 - INJURIES OR ILLNESSES WITH LOST WORKDAYS - Self Explanatory

Any injury which involves days away from work, or days of restricted work activity, or both, must be recorded since it always involves one or more of the criteria for recordability.



**Columns 3 and 10 - INJURIES OR ILLNESSES INVOLVING DAYS AWAY FROM WORK - Self Explanatory**

**Columns 4 and 11 - LOST WORKDAYS -- DAYS AWAY FROM WORK.**

Enter the number of workdays (consecutive or not) on which the employee would have worked but could not because of occupational injury or illness. The number of lost workdays should not include the day of injury or onset of illness or any days on which the employee would not have worked even though able to work. NOTE: For employees not having a regularly scheduled shift, such as certain truck drivers, construction workers, farm labor, casual labor, part-time employees, etc., it may be necessary to estimate the number of lost workdays. Estimates of lost workdays shall be based on prior work history of the employee AND days worked by employees, not ill or injured, working in the department and/or occupation of the ill or injured employee.

**Columns 5 and 12 - LOST WORKDAYS -- DAYS OF RESTRICTED WORK ACTIVITY.**

Enter the number of workdays (consecutive or not) on which because of injury or illness:

- (1) the employee was assigned to another job on a temporary basis, or
- (2) the employee worked at a permanent job less than full time, or
- (3) the employee worked at a permanently assigned job but could not perform all duties normally connected with it.

The number of lost workdays should not include the day of injury or onset of illness or any days on which the employee would not have worked even though able to work.

**Columns 6 and 13 - INJURIES OR ILLNESSES WITHOUT LOST WORKDAYS - Self Explanatory**

**Columns 7a through 7g - TYPE OF ILLNESS. Enter a check in only *one* column for each illness.**

TERMINATION OR PERMANENT TRANSFER - Place an asterisk to the right of the entry in columns 7a through 7g (type of illness) which represented a termination of employment or permanent transfer.

**V. Totals**

Add number of entries in columns 1 and 8.

Add number of checks in columns 2, 3, 6, 7, 9, 10 and 13.

Add number of days in columns 4, 5, 11 and 12.

Yearly totals for each column (1-13) are required for posting. Running or page totals may be generated at the discretion of the employer.

In an employee's loss of workdays is continuing at the time the totals are summarized, estimate the number of future workdays the employee will lose and add that estimate to the workdays already lost and include this figure in the annual totals. No further entries are to be made with respect to such cases in the next year's log.

**VI. Definitions**

OCCUPATIONAL INJURY is any injury such as a cut, fracture, sprain, amputation, etc. which results from a work accident or from an exposure involving a single incident in the work environment. NOTE: Conditions resulting from animal bites, such as insect or snake bites or from one-time exposure to chemicals, are considered to be injuries.

OCCUPATIONAL ILLNESS of an employee is any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. It includes acute and chronic illnesses or diseases which may be caused by inhalation, absorption, ingestion, or direct contact.

The following listing gives the categories of occupational illnesses and disorders that will be utilized for the purpose of classifying recordable illnesses. For purposes of information, examples of each category are given. These are typical examples, however, and are not to be considered the complete listing of the types of illnesses and disorders that are to be counted under each category.

7a. Occupational Skin Diseases or Disorders. Examples: Contact dermatitis, eczema, or rash caused by primary irritants and sensitizers or poisonous plants; oil acne; chrome ulcers; chemical burns or inflammation, etc.

7b. Dust Diseases of the Lungs (Pneumoconioses). Examples: Silicosis, asbestosis and other asbestos-related diseases, coal worker's pneumoconioses, byssinosis, siderosis, and other pneumoconioses.

7c. Respiratory Conditions Due to Toxic Agents. Examples: Pneumonitis, pharyngitis, rhinitis or acute congestion due to chemicals, dusts, gases, or fumes; farmer's lung; etc.

7d. Poisoning (Systemic Effects of Toxic Materials). Examples: Poisoning by lead, mercury, cadmium, arsenic, or other metals; poisoning by

carbon monoxide, hydrogen sulfide, or other gases; poisoning by benzol, carbon tetrachloride, or other organic solvents; poisoning by insecticide sprays such as parathion, lead arsenate; poisoning by other chemicals such as formaldehyde, plastics, and resins; etc.

7e. Disorders Due to Physical Agents (Other than Toxic Materials). Examples: Heatstroke, sunstroke, heat exhaustion, and other effects of environmental heat, freezing, frostbite, and effects of exposure to low temperatures; caisson disease; effects of ionizing radiation (isotopes, X-rays, radium); effects of nonionizing radiation (welding flash, ultraviolet rays, microwaves, sunburn); etc.

7f. Disorders Associated with Repeated Trauma. Examples: Noise-induced hearing loss; synovitis, tenosynovitis, and bursitis. Raynaud's phenomena; and other conditions due to repeated motion, vibration, or pressure.

7g. All Other Occupational Illnesses. Examples: Anthrax, brucellosis, infectious hepatitis, malignant and benign tumors, food poisoning, histoplasmosis, coccidioidomycosis, etc.

MEDICAL TREATMENT includes treatment (other than first aid) administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does NOT include first aid treatment (one-time treatment and subsequent observation of minor scratches, cuts, burns, splinters, and so forth, which do not ordinarily require medical care) even though provided by a physician or registered professional personnel.

ESTABLISHMENT: A single physical location where business is conducted or where services or industrial operations are performed (for example: a factory, mill, store, hotel, restaurant, movie theater, farm, ranch, bank, sales office, warehouse, or central administrative office). Where distinctly separate activities are performed at a single physical location, such as construction activities operated from the same physical locations as a lumber yard, each activity shall be treated as a separate establishment.

For firms engaged in activities which may be physically dispersed, such as agriculture; construction; transportation; communications and electric, gas, and sanitary services, records may be maintained at a place to which employees report each day.

Records for personnel who do not primarily report or work at a single establishment, such as traveling salesmen, technicians, engineers, etc., shall be maintained at the location from which they are paid or the base from which personnel operate to carry out their activities.

WORK ENVIRONMENT is comprised of the physical location, equipment, materials processed or used, and the kinds of operations performed in the course of an employee's work, whether on or off the employer's premises.

**Appendix D:**  
MSDS Sheets

## SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006

Version 5.0 Revision Date 29.10.2012

Print Date 19.04.2017

GENERIC EU MSDS - NO COUNTRY SPECIFIC DATA - NO OEL DATA

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**1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING****1.1 Product identifiers**

Product name : Arsenic

Product Number : 267961  
Brand : Aldrich  
Index-No. : 033-001-00-X  
CAS-No. : 7440-38-2**1.2 Relevant identified uses of the substance or mixture and uses advised against**

Identified uses : Laboratory chemicals, Manufacture of substances

**1.3 Details of the supplier of the safety data sheet**Company : Sigma-Aldrich Israel Ltd.  
3 PARK RABIN, PLAUT  
7670603 REHOVOT  
ISRAELTelephone : +972 8948-4222  
Fax : +972 8948-4200**1.4 Emergency telephone number**

Emergency Phone # : +972 (8) 948-4222

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**2. HAZARDS IDENTIFICATION****2.1 Classification of the substance or mixture****Classification according to Regulation (EC) No 1272/2008 [EU-GHS/CLP]**Acute aquatic toxicity (Category 1)  
Chronic aquatic toxicity (Category 1)  
Acute toxicity, Inhalation (Category 3)  
Acute toxicity, Oral (Category 3)**Classification according to EU Directives 67/548/EEC or 1999/45/EC**

Toxic by inhalation and if swallowed. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

**2.2 Label elements****Labelling according Regulation (EC) No 1272/2008 [CLP]**

Pictogram



Signal word : Danger

Hazard statement(s)

H301 : Toxic if swallowed.  
H331 : Toxic if inhaled.  
H410 : Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P261 : Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.  
P273 : Avoid release to the environment.  
P301 + P310 : IF SWALLOWED: Immediately call a POISON CENTER or doctor/

P311 physician.  
 Call a POISON CENTER or doctor/ physician.  
 P501 Dispose of contents/ container to an approved waste disposal plant.

Supplemental Hazard Statements none

**According to European Directive 67/548/EEC as amended.**

Hazard symbol(s)



R-phrase(s)

R23/25

Toxic by inhalation and if swallowed.

R50/53

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

S-phrase(s)

S20/21

When using do not eat, drink or smoke.

S28

After contact with skin, wash immediately with plenty of soap and water.

S45

In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

S60

This material and its container must be disposed of as hazardous waste.

S61

Avoid release to the environment. Refer to special instructions/ Safety data sheets.

**2.3 Other hazards - none**

**3. COMPOSITION/INFORMATION ON INGREDIENTS**

**3.1 Substances**

Formula : As  
 Molecular Weight : 74,92 g/mol

Component		Concentration
<b>Arsenic</b>		
CAS-No.	7440-38-2	-
EC-No.	231-148-6	-
Index-No.	033-001-00-X	-

**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**

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.

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

no data available

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## 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

Arsenic oxides

### 5.3 Advice for firefighters

Wear self contained breathing apparatus for fire fighting if necessary.

### 5.4 Further information

no data available

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## 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.

### 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.

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

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

### 7.3 Specific end uses

no data available

---

## 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.

The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it.

Immersion protection

Material: Nitrile rubber

Minimum layer thickness: 0,11 mm

Break through time: > 480 min

Material tested: Dermatril® (Aldrich Z677272, Size M)

Splash protection

Material: Nitrile rubber

Minimum layer thickness: 0,11 mm

Break through time: > 30 min

Material tested: Dermatril® (Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 873000, 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.

### Body Protection

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

### Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N99 (US) or type P2 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

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## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

- |                                                 |                                    |
|-------------------------------------------------|------------------------------------|
| a) Appearance                                   | Form: powder<br>Colour: grey       |
| b) Odour                                        | no data available                  |
| c) Odour Threshold                              | no data available                  |
| d) pH                                           | no data available                  |
| e) Melting point/freezing point                 | Melting point/range: 817 °C - lit. |
| f) Initial boiling point and boiling range      | 613 °C - lit.                      |
| g) Flash point                                  | not applicable                     |
| h) Evaporation rate                             | no data available                  |
| i) Flammability (solid, gas)                    | no data available                  |
| j) Upper/lower flammability or explosive limits | no data available                  |
| k) Vapour pressure                              | no data available                  |
| l) Vapour density                               | no data available                  |
| m) Relative density                             | 5,727 g/mL at 25 °C                |
| 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

---

## 10. STABILITY AND REACTIVITY

### 10.1 Reactivity

no data available

### 10.2 Chemical stability

no data available

### 10.3 Possibility of hazardous reactions

no data available

### 10.4 Conditions to avoid

Heat. Exposure to air may affect product quality.

### 10.5 Incompatible materials

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

### 10.6 Hazardous decomposition products

Other decomposition products - no data available

---

## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

#### Acute toxicity

LD50 Oral - rat - 763 mg/kg

Remarks: Behavioral:Ataxia. Diarrhoea

LD50 Oral - mouse - 145 mg/kg

Remarks: Behavioral:Ataxia. Diarrhoea

Inhalation: no data available

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

IARC: 1 - Group 1: Carcinogenic to humans (Arsenic)

#### 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

**Potential health effects**

<b>Inhalation</b>	Toxic if inhaled. May cause respiratory tract irritation.
<b>Ingestion</b>	Harmful if swallowed.
<b>Skin</b>	May be harmful if absorbed through skin. May cause skin irritation.
<b>Eyes</b>	May cause eye irritation.

**Signs and Symptoms of Exposure**

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.

**Additional Information**

RTECS: CG0525000

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**12. ECOLOGICAL INFORMATION****12.1 Toxicity**

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 9,9 mg/l - 96,0 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 3,8 mg/l - 48 h

**12.2 Persistence and degradability**

no data available

**12.3 Bioaccumulative potential**

no data available

**12.4 Mobility in soil**

no data available

**12.5 Results of PBT and vPvB assessment**

no data available

**12.6 Other adverse effects**

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. 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.

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**14. TRANSPORT INFORMATION****14.1 UN number**

ADR/RID: 1558

IMDG: 1558

IATA: 1558

**14.2 UN proper shipping name**

ADR/RID: ARSENIC

IMDG: ARSENIC

IATA: Arsenic

<b>14.3 Transport hazard class(es)</b>			
ADR/RID: 6.1	IMDG: 6.1		IATA: 6.1
<b>14.4 Packaging group</b>			
ADR/RID: II	IMDG: II		IATA: II
<b>14.5 Environmental hazards</b>			
ADR/RID: yes	IMDG Marine pollutant: yes		IATA: no
<b>14.6 Special precautions for user</b>			
no data available			

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**15. REGULATORY INFORMATION**

This safety datasheet complies with the requirements of Regulation (EC) No. 1907/2006.

**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**  
no data available

**15.2 Chemical Safety Assessment**  
no data available

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**16. OTHER INFORMATION**

**Further information**

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](http://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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## SAFETY DATA SHEET

Revision Date 19-Jan-2018

Revision Number 3

### 1. Identification

**Product Name** 1,2-Benzanthracene

**Cat No. :** AC105250000; AC105250010; AC105252500

**Synonyms** Benzólanthracene; Tetraphene

**Recommended Use** Laboratory chemicals.  
**Uses advised against** Food, drug, pesticide or biocidal product use.  
**Details of the supplier of the safety data sheet**

**Company**

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

Acros Organics  
One Reagent Lane  
Fair Lawn, NJ 07410

**Emergency Telephone Number**

For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11  
Emergency Number **US**:001-201-796-7100 / **Europe**: +32 14 57 52 99  
**CHEMTREC** Tel. No.**US**:001-800-424-9300 / **Europe**:001-703-527-3887

### 2. Hazard(s) identification

**Classification**

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

Carcinogenicity Category 1B

**Label Elements**

**Signal Word**

Danger

**Hazard Statements**

May cause cancer

**Precautionary Statements****Prevention**

Obtain special instructions before use  
Do not handle until all safety precautions have been read and understood  
Use personal protective equipment as required

**Response**

IF exposed or concerned: Get medical attention/advice

**Storage**

Store locked up

**Disposal**

Dispose of contents/container to an approved waste disposal plant

**Hazards not otherwise classified (HNOC)**

Very toxic to aquatic life with long lasting effects  
WARNING. Cancer - <https://www.p65warnings.ca.gov/>.

### 3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Benz[a]anthracene	56-55-3	99

### 4. First-aid measures

<b>Eye Contact</b>	Immediate medical attention is required. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
<b>Skin Contact</b>	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Immediate medical attention is required.
<b>Inhalation</b>	Remove from exposure, lie down. Remove to fresh air. If not breathing, give artificial respiration. Immediate medical attention is required.
<b>Ingestion</b>	Call a physician immediately. Clean mouth with water.
<b>Most important symptoms and effects</b>	No information available.
<b>Notes to Physician</b>	Treat symptomatically

### 5. Fire-fighting measures

<b>Suitable Extinguishing Media</b>	Water spray. Carbon dioxide (CO <sub>2</sub> ). Dry chemical. Chemical foam.
<b>Unsuitable Extinguishing Media</b>	No information available
<b>Flash Point</b>	No information available
<b>Method -</b>	No information available
<b>Autoignition Temperature</b>	Not applicable
<b>Explosion Limits</b>	
<b>Upper</b>	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<sub>2</sub>).

**Protective Equipment and Precautions for Firefighters**

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

**NFPA**

<b>Health</b> 0	<b>Flammability</b> 1	<b>Instability</b> 0	<b>Physical hazards</b> N/A
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**6. Accidental release measures**

<b>Personal Precautions</b>	Ensure adequate ventilation. Use personal protective equipment as required.
<b>Environmental Precautions</b>	Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained.

**Methods for Containment and Clean Up** Sweep up and shovel into suitable containers for disposal.

**7. Handling and storage**

<b>Handling</b>	Do not breathe dust. Do not get in eyes, on skin, or on clothing. Handle product only in closed system or provide appropriate exhaust ventilation.
<b>Storage</b>	Keep in a dry, cool and well-ventilated place. Refer product specification and/or product label for specific storage temperature requirement. Keep container tightly closed.

**8. Exposure controls / personal protection**

<b>Exposure Guidelines</b>	This product does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.
<b>Engineering Measures</b>	Ensure adequate ventilation, especially in confined areas.
<b>Personal Protective Equipment</b>	
<b>Eye/face Protection</b>	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
<b>Skin and body protection</b>	Wear appropriate protective gloves and clothing to prevent skin exposure.
<b>Respiratory Protection</b>	Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.
<b>Hygiene Measures</b>	Handle in accordance with good industrial hygiene and safety practice.

**9. Physical and chemical properties**

<b>Physical State</b>	Powder Solid
-----------------------	--------------

Appearance	Beige
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	158 - 161 °C / 316.4 - 321.8 °F
Boiling Point/Range	437.6 °C / 819.7 °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	No information available
Vapor Density	Not applicable
Specific Gravity	No information available
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	C18 H12
Molecular Weight	228.29

## 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 <sub>2</sub> )
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
Benz[a]anthracene	56-55-3	Group 2B	Reasonably Anticipated	A2	X	A2

**Mutagenic Effects** Ames test: positive.

**Reproductive Effects** No information available.

<b>Developmental Effects</b>	No information available.
<b>Teratogenicity</b>	No information available.
<b>STOT - single exposure</b>	None known
<b>STOT - repeated exposure</b>	None known
<b>Aspiration hazard</b>	No information available
<b>Symptoms / effects, both acute and delayed</b>	No information available

**Endocrine Disruptor Information**

Component	EU - Endocrine Disruptors Candidate List	EU - Endocrine Disruptors - Evaluated Substances	Japan - Endocrine Disruptor Information
Benz[a]anthracene	Group III Chemical	Not applicable	Not applicable

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

## 12. Ecological information

**Ecotoxicity**

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

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Benz[a]anthracene	Not listed	Not listed	EC50 = 0.26 mg/L 15 min	LC50: = 0.01 mg/L, 96h Static (Daphnia magna) EC50: = 0.0042 mg/L, 48h (Daphnia magna)

**Persistence and Degradability** May persist

**Bioaccumulation/ Accumulation** No information available.

**Mobility** . Is not likely mobile in the environment due its low water solubility.

Component	log Pow
Benz[a]anthracene	5.61

## 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
Benz[a]anthracene - 56-55-3	U018	-

## 14. Transport information

<b>DOT</b>	Not regulated
<b>TDG</b>	Not regulated
<b>IATA</b>	
<b>UN-No</b>	UN3077
<b>Proper Shipping Name</b>	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.*
<b>Hazard Class</b>	9
<b>Packing Group</b>	III
<b>IMDG/IMO</b>	
<b>UN-No</b>	UN3077
<b>Proper Shipping Name</b>	Environmentally hazardous substances, solid, n.o.s.

Hazard Class 9  
Packing Group III

### 15. Regulatory information

#### United States of America Inventory

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
Benz[a]anthracene	56-55-3	X	ACTIVE	-

**Legend:**

TSCA - Toxic Substances Control Act, (40 CFR Part 710)

X - Listed

'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

#### International Inventories

Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
Benz[a]anthracene	56-55-3	-	X	200-280-6	-	-	-	X	-

#### U.S. Federal Regulations

##### SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Benz[a]anthracene	56-55-3	99	0.1

SARA 311/312 Hazard Categories See section 2 for more information

##### CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Benz[a]anthracene	-	-	-	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
Benz[a]anthracene	10 lb	-

California Proposition 65 This product contains the following Proposition 65 chemicals.

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Benz[a]anthracene	56-55-3	Carcinogen	0.033 µg/day	Carcinogen

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

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Benz[a]anthracene	X	X	X	X	X

#### U.S. Department of Transportation

Reportable Quantity (RQ): N



DOT Marine Pollutant N  
DOT Severe Marine Pollutant N

**U.S. Department of Homeland Security** This product does not contain any DHS chemicals.

**Other International Regulations**

**Mexico - Grade** No information available

## 16. Other information

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

**Revision Date** 19-Jan-2018

**Print Date** 19-Jan-2018

**Revision Summary** This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

**Disclaimer**

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

**End of SDS**

## SAFETY DATA SHEET

Revision Date 14-Feb-2020

Revision Number 2

### 1. Identification

**Product Name** Benzo[a]pyrene

**Cat No. :** 15856

**CAS-No** 50-32-8  
**Synonyms** Benzo[def]chrysene.; 3,4-Benzopyrene; 3,4-Benzpyrene

**Recommended Use** Laboratory chemicals.  
**Uses advised against** Food, drug, pesticide or biocidal product use.  
**Details of the supplier of the safety data sheet**

#### Company

Alfa Aesar  
Thermo Fisher Scientific Chemicals, Inc.  
30 Bond Street  
Ward Hill, MA 01835-8099  
Tel: 800-343-0660  
Fax: 800-322-4757  
**Email:** tech@alfa.com  
www.alfa.com

#### **Emergency Telephone Number**

During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660.  
After normal business hours, call Carechem 24 at (866) 928-0789.

### 2. Hazard(s) identification

#### Classification

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

Skin Sensitization	Category 1
Germ Cell Mutagenicity	Category 1B
Carcinogenicity	Category 1A
Reproductive Toxicity	Category 1B

#### Label Elements

#### **Signal Word**

Danger

#### **Hazard Statements**

May cause an allergic skin reaction  
May cause genetic defects  
May cause cancer  
May damage fertility. May damage the unborn child



### Precautionary Statements

#### Prevention

Obtain special instructions before use  
 Do not handle until all safety precautions have been read and understood  
 Use personal protective equipment as required  
 Avoid breathing dust/fume/gas/mist/vapors/spray  
 Contaminated work clothing should not be allowed out of the workplace  
 Wear protective gloves

#### Response

IF exposed or concerned: Get medical attention/advice

#### Skin

IF ON SKIN: Wash with plenty of soap and water  
 If skin irritation or rash occurs: Get medical advice/attention  
 Wash contaminated clothing before reuse

#### Storage

Store locked up

#### Disposal

Dispose of contents/container to an approved waste disposal plant

#### Hazards not otherwise classified (HNOC)

Very toxic to aquatic life with long lasting effects  
 WARNING. Cancer - <https://www.p65warnings.ca.gov/>.

## 3. Composition/Information on Ingredients

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

## 4. First-aid measures

<b>General Advice</b>	If symptoms persist, call a physician.
<b>Eye Contact</b>	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.
<b>Skin Contact</b>	Wash off immediately with plenty of water for at least 15 minutes. If skin irritation persists, call a physician.
<b>Inhalation</b>	Remove to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur.
<b>Ingestion</b>	Clean mouth with water and drink afterwards plenty of water. Get medical attention if symptoms occur.
<b>Most important symptoms and effects</b>	None reasonably foreseeable. . May cause allergic skin reaction. Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing
<b>Notes to Physician</b>	Treat symptomatically

## 5. Fire-fighting measures

**Unsuitable Extinguishing Media** No information available

**Flash Point Method -** No information available  
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<sub>2</sub>).

**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**  
2

**Flammability**  
1

**Instability**  
0

**Physical hazards**  
N/A

## 6. Accidental release measures

**Personal Precautions**

Ensure adequate ventilation. Use personal protective equipment as required. 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.

**Methods for Containment and Clean Up**

Sweep up and shovel into suitable containers for disposal. Keep in suitable, closed containers for disposal.

## 7. Handling and storage

**Handling**

Wear personal protective equipment/face protection. 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**

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Benzo[a]pyrene		TWA: 0.2 mg/m <sup>3</sup>		

*Legend*

OSHA - Occupational Safety and Health Administration

**Engineering Measures**

Ensure adequate ventilation, especially in confined areas.

**Personal Protective Equipment**

**Eye/face Protection**

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard

EN166.

<b>Skin and body protection</b>	Wear appropriate protective gloves and clothing to prevent skin exposure.
<b>Respiratory Protection</b>	Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.
<b>Hygiene Measures</b>	Handle in accordance with good industrial hygiene and safety practice.

## 9. Physical and chemical properties

<b>Physical State</b>	Powder Solid
<b>Appearance</b>	Dark yellow
<b>Odor</b>	aromatic
<b>Odor Threshold</b>	No information available
<b>pH</b>	Not applicable
<b>Melting Point/Range</b>	175 - 179 °C / 347 - 354.2 °F
<b>Boiling Point/Range</b>	495 °C / 923 °F @ 760 mmHg
<b>Flash Point</b>	No information available
<b>Evaporation Rate</b>	Not applicable
<b>Flammability (solid,gas)</b>	No information available
<b>Flammability or explosive limits</b>	
<b>Upper</b>	No data available
<b>Lower</b>	No data available
<b>Vapor Pressure</b>	No information available
<b>Vapor Density</b>	Not applicable
<b>Specific Gravity</b>	No information available
<b>Solubility</b>	Insoluble in water
<b>Partition coefficient; n-octanol/water</b>	No data available
<b>Autoignition Temperature</b>	Not applicable
<b>Decomposition Temperature</b>	No information available
<b>Viscosity</b>	Not applicable
<b>Molecular Formula</b>	C <sub>20</sub> H <sub>12</sub>
<b>Molecular Weight</b>	252.31

## 10. Stability and reactivity

<b>Reactive Hazard</b>	None known, based on information available
<b>Stability</b>	Stable under normal conditions.
<b>Conditions to Avoid</b>	Incompatible products.
<b>Incompatible Materials</b>	Oxidizing agent
<b>Hazardous Decomposition Products</b>	Carbon monoxide (CO), Carbon dioxide (CO <sub>2</sub> )
<b>Hazardous Polymerization</b>	Hazardous polymerization does not occur.
<b>Hazardous Reactions</b>	None under normal processing.

## 11. Toxicological information

### Acute Toxicity

### **Product Information**

### **Component Information**

**Toxicologically Synergistic** No information available

### **Products**

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

<b>Irritation</b>	No information available
<b>Sensitization</b>	May cause sensitization by skin contact
<b>Carcinogenicity</b>	The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Benzo[a]pyrene	50-32-8	Group 1	Reasonably Anticipated	A2	X	A2

*IARC (International Agency for Research on Cancer)*

*IARC (International Agency for Research on Cancer)*

*Group 1 - Carcinogenic to Humans*

*Group 2A - Probably Carcinogenic to Humans*

*Group 2B - Possibly Carcinogenic to Humans*

*NTP: (National Toxicity Program)*

*Known - Known Carcinogen*

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

*NTP: (National Toxicity Program)*

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

*A1 - Known Human Carcinogen*

*A2 - Suspected Human Carcinogen*

*A3 - Animal Carcinogen*

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

**Mutagenic Effects** No information available

**Reproductive Effects** No information available.

**Developmental Effects** No information available.

**Teratogenicity** No information available.

**STOT - single exposure** None known

**STOT - repeated exposure** None known

**Aspiration hazard** No information available

**Symptoms / effects, both acute and delayed** Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing

#### Endocrine Disruptor Information

Component	EU - Endocrine Disruptors Candidate List	EU - Endocrine Disruptors - Evaluated Substances	Japan - Endocrine Disruptor Information
Benzo[a]pyrene	Group III Chemical	Not applicable	Not applicable

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

## 12. Ecological information

### Ecotoxicity

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** May persist

**Bioaccumulation/ Accumulation** No information available.

**Mobility** Is not likely mobile in the environment due its low water solubility.

Component	log Pow
Benzo[a]pyrene	6.06

## 13. Disposal considerations

**Waste Disposal Methods** Chemical waste generators must determine whether a discarded chemical is classified as a

hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Benzo[a]pyrene - 50-32-8	U022	-

## 14. Transport information

### DOT

UN-No	UN3077
Proper Shipping Name	Environmentally hazardous substances, solid, n.o.s.
Technical Name	Benzo[a]pyrene
Hazard Class	9
Packing Group	III

### TDG

UN-No	UN3077
Proper Shipping Name	Environmentally hazardous substances, solid, n.o.s.
Hazard Class	9
Packing Group	III

### IATA

UN-No	UN3077
Proper Shipping Name	Environmentally hazardous substances, solid, n.o.s.
Hazard Class	9
Packing Group	III

### IMDG/IMO

UN-No	UN3077
Proper Shipping Name	Environmentally hazardous substances, solid, n.o.s.
Hazard Class	9
Packing Group	III

## 15. Regulatory information

### United States of America Inventory

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
Benzo[a]pyrene	50-32-8	X	ACTIVE	-

#### Legend:

TSCA - Toxic Substances Control Act, (40 CFR Part 710)

X - Listed

'-' - Not Listed

TSCA 12(b) - Notices of Export      Not applicable

### International Inventories

Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
Benzo[a]pyrene	50-32-8	X	-	200-028-5	X	-	-	X	KE-05-0184

### U.S. Federal Regulations

#### SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Benzo[a]pyrene	50-32-8	> 96	0.1

SARA 311/312 Hazard Categories      See section 2 for more information

**CWA (Clean Water Act)**

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Benzo[a]pyrene	-	-	X	X

**Clean Air Act** Not applicable

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

**CERCLA** Not applicable

Component	Hazardous Substances RQs	CERCLA EHS RQs
Benzo[a]pyrene	1 lb	-

**California Proposition 65** This product contains the following Proposition 65 chemicals.

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Benzo[a]pyrene	50-32-8	Carcinogen	0.06 µg/day	Carcinogen

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

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Benzo[a]pyrene	X	X	X	X	X

**U.S. Department of Transportation**

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

**U.S. Department of Homeland Security** This product does not contain any DHS chemicals.

**Other International Regulations**

**Mexico - Grade** No information available

## 16. Other information

**Prepared By** Health, Safety and Environmental Department  
 Email: tech@alfa.com  
 www.alfa.com

**Revision Date** 14-Feb-2020  
**Print Date** 14-Feb-2020  
**Revision Summary** SDS authoring systems update, replaces ChemGes SDS No. 50-32-8/1.

**Disclaimer**

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

**End of SDS**





## Safety Data Sheet

Revision Date: 07/31/19

www.restek.com

2 Letter ISO country code/language code: US/EN

### 1. IDENTIFICATION

**Catalog Number / Product Name:** 31272 / Benzo(b)fluoranthene Standard  
**Company:** Restek Corporation  
**Address:** 110 Benner Circle  
Bellefonte, Pa. 16823  
**Phone#:** 814-353-1300  
**Fax#:** 814-353-1309  
**Emergency#:** 800-424-9300 (CHEMTREC)  
703-527-3887 (Outside the US)  
**Email:** www.restek.com  
**Revision Number:** 11  
**Intended use:** For Laboratory use only

### 2. HAZARD(S) IDENTIFICATION

#### Emergency Overview:

GHS Hazard  
Symbols:



**GHS Classification:** Carcinogenicity Category 1B  
Flammable Liquid Category 2  
Serious Eye Damage/Eye Irritation Category 2  
Specific Target Organ Systemic Toxicity (STOT) - Single Exposure Category 3

**GHS Signal Word:** Danger

**GHS Hazard:** Highly flammable liquid and vapour.  
Causes serious eye irritation.  
May cause drowsiness or dizziness.  
May cause cancer.

**GHS Precautions:**

**Safety Precautions:** 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.  
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.  
Avoid breathing dust/fume/gas/mist/vapours/spray.  
Wash hands and skin thoroughly after handling.  
Use only outdoors or in a well-ventilated area.  
Wear protective gloves/protective clothing/eye protection/face protection.

**First Aid Measures:** IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.  
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.  
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do.  
Continue rinsing.  
IF exposed or concerned: Get medical advice/attention.  
Call a POISON CENTER or doctor/physician if you feel unwell.  
If eye irritation persists: Get medical advice/attention.  
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:** Specific target organ toxicity - Single exposure - STOT SE 3: H336 May cause drowsiness or dizziness.

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

### 3. COMPOSITION / INFORMATION ON INGREDIENT

Chemical Name	CAS #	EINEC #	% Composition
Acetone	67-64-1	200-662-2	99.9
benzo (b) fluoranthene	205-99-2	205-911-9	0.1

### 4. FIRST-AID MEASURES

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

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

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

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

### 5. FIRE- FIGHTING MEASURES

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

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

**Fire Fighting Methods and Protection:** Do not enter fire area without proper protection including self-contained toxic breathing apparatus and full protective equipment. Fight fire from a safe distance and a protected location due to the potential of hazardous vapors and decomposition products. Flammable component(s) of this material may be lighter than water and burn while floating on the surface. Use water spray/fog for cooling. 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 irritating or harmful. Follow personal protective equipment recommendations found in Section 8 of this SDS. Additional precautions may be necessary based on special circumstances created by the spill including; the material spilled, the quantity of the spill, the area in which the spill occurred. Also consider the expertise of employees in the area responding to the spill.

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

evaluation.

## 7. HANDLING AND STORAGE

<b>Handling Technical Measures and Precautions:</b>	Harmful or irritating material. Avoid contacting and avoid breathing the material. Use only in a well ventilated area. Use spark-proof tools and explosion-proof equipment
<b>Storage Technical Measures and Conditions:</b>	Store in a cool dry ventilated location. Isolate from incompatible materials and conditions. Keep container(s) closed. Keep away from sources of ignition

## 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

### United States:

Chemical Name	CAS No.	IDLH	ACGIH STEL	ACGIH TLV-TWA	OSHA Exposure Limit
Acetone	67-64-1	2500 ppm IDLH (10% LEL)	750 ppm STEL; 1782 mg/m3 STEL	500 ppm TWA; 1188 mg/m3 TWA	1000 ppm TWA; 2400 mg/m3 TWA
benzo (b) fluoranthene	205-99-2	Not established	None Known	Not established	No data available

### Personal Protection:

<b>Engineering Measures:</b>	Local exhaust ventilation is recommended when generating excessive levels of vapours from handling or thermal processing.
<b>Respiratory Protection:</b>	No respiratory protection required under normal conditions of use. Provide general room exhaust ventilation if symptoms of overexposure occur as explained Section 3. A respirator is not normally required.
<b>Eye Protection:</b>	Wear chemically resistant safety glasses with side shields when handling this product. Do not wear contact lenses.
<b>Skin Protection:</b>	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
<b>Medical Conditions Aggravated By Exposure:</b>	Respiratory disease including asthma and bronchitis

## 9. PHYSICAL AND CHEMICAL PROPERTIES

<b>Appearance, color:</b>	Depends upon product selection
<b>Odor:</b>	Strong
<b>Physical State:</b>	No data available
<b>pH:</b>	Not applicable
<b>Vapor Pressure:</b>	No data available
<b>Vapor Density:</b>	2.0 (air = 1)
<b>Boiling Point (°C):</b>	56.05 °C at 1013.25 hPa
<b>Melting Point (°C):</b>	-95.4 °C Melting Point
<b>Flash Point (°F):</b>	39
<b>Flammability:</b>	Highly Flammable
<b>Upper Flammable/Explosive Limit, % in air:</b>	No data available
<b>Lower Flammable/Explosive Limit, % in air:</b>	No data available
<b>Autoignition Temperature (°C):</b>	465 deg C
<b>Decomposition Temperature (°C):</b>	No data available
<b>Specific Gravity:</b>	0.7845 g/cm3 at 25 °C
<b>Evaporation Rate:</b>	No data available
<b>Odor Threshold:</b>	ND
<b>Solubility:</b>	Complete; 100%
<b>Partition Coefficient: n-octanol in water:</b>	No data available
<b>VOC % by weight:</b>	99.9
<b>Molecular Weight:</b>	58.08

## 10. STABILITY AND REACTIVITY

<b>Stability:</b>	Stable under normal conditions.
<b>Conditions to Avoid:</b>	None known.
<b>Materials to Avoid / Chemical Incompatibility:</b>	Strong oxidizing agents Strong acids
<b>Hazardous Decomposition Products:</b>	Carbon dioxide Carbon monoxide

## 11. TOXICOLOGICAL INFORMATION

<b>Routes of Entry:</b>	Inhalation, Skin Contact, Eye Contact, Ingestion
-------------------------	--------------------------------------------------

**Target Organs Potentially Affected By Exposure:** Eyes, Central nervous system stimulation,  
Respiratory Tract, Skin

**Chemical Interactions That Change Toxicity:** None Known

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

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

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

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

**Component Toxicological Data:**

**NIOSH:**

Chemical Name	CAS No.	LD50/LC50
Acetone	67-64-1	Dermal LD50 Rabbit >15700 mg/kg; Inhalation LC50 Rat 50100 mg/m <sup>3</sup> 8 h; Oral LD50 Rat 5800 mg/kg

**Component Carcinogenic Data:**

**OSHA:**

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

**ACGIH:**

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

**NIOSH:**

Chemical Name	CAS No.
No data available	

**NTP:**

Chemical Name	CAS No.
No data available	

**IARC:**

Chemical Name	CAS No.	Group No.
Monograph 92 [2010]; Supplement 7 [1987]; Monograph 32 [1983]	205-99-2	Group 2B

**12. ECOLOGICAL INFORMATION**

<b>Overview:</b>	This material is not expected to be harmful to the ecology.
<b>Mobility:</b>	No data
<b>Persistence:</b>	No data
<b>Bioaccumulation:</b>	No data
<b>Degradability:</b>	No data
<b>Ecological Toxicity Data:</b>	No data available

**13. DISPOSAL CONSIDERATIONS**

<b>Waste Description of Spent Product:</b>	Spent or discarded material is a hazardous waste. Mixing spent or discarded material with other materials may render the mixture hazardous. Perform a hazardous waste determination on mixtures.
--------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

**Disposal Methods:** Dispose of by incineration following Federal, State, Local, or Provincial regulations.

**Waste Disposal of Packaging:** Comply with all Local, State, Federal, and Provincial Environmental Regulations.

#### 14. TRANSPORTATION INFORMATION

**United States:**  
**DOT Proper Shipping Name:** Acetone  
**UN Number:** UN1090  
**Hazard Class:** 3  
**Packing Group:** II

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

**Marine Pollutant:** No

Chemical Name	CAS#	Marine Pollutant	Severe Marine Pollutant
No data available			

#### 15. REGULATORY INFORMATION

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

The following chemicals are listed on CA Prop 65:

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

State Right To Know Listing:

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

#### 16. OTHER INFORMATION

**Prior Version Date:** 08/13/18

**Other Information:** Any changes to the SDS compared to previous versions are marked by a vertical line in front of the concerned paragraph.

**References:** No data available

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Material Safety Data Sheet

Chrysene, 98%

MSDS# 95251

Section 1 - Chemical Product and Company Identification

MSDS Name: Chrysene, 98%  
Catalog Numbers: AC224140000, AC224140010, AC224140050, AC224145000  
Synonyms: 1,2-Benzophenanthrene; Benzo(a)phenanthrene; 1,2,5,6-Dibenzonaphthalene.

Company Identification: Acros Organics BVBA  
Janssen Pharmaceuticaaan 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#: 218-01-9  
Chemical Name: Chrysene  
%: 98  
EINECS#: 205-923-4  
-----

Hazard Symbols: T



Risk Phrases: 45 50/53

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Caution! May cause respiratory tract irritation. May cause eye and skin irritation. May cause cancer in humans. Target Organs: Liver, skin.

Potential Health Effects

Eye: May cause eye irritation.  
Skin: May cause skin irritation.  
Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea.  
Inhalation: May cause respiratory tract irritation.  
Chronic: May cause cancer according to animal studies.

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. 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 immediately.

**Inhalation:** Get medical aid immediately. Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

**Notes to Physician:**

#### Section 5 - Fire Fighting Measures

**General Information:** As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. This material in sufficient quantity and reduced particle size is capable of creating a dust explosion.

**Extinguishing Media:** Use water spray, dry chemical, carbon dioxide, or chemical foam.

**Autoignition Temperature:** Not available.

**Flash Point:** Not applicable.

**Explosion Limits: Lower:** Not available

**Explosion Limits: Upper:** Not available

**NFPA Rating:** health: ; flammability: 1; instability: ;

#### 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. Clean up spills immediately, observing precautions in the Protective Equipment section. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section). Provide ventilation.

#### Section 7 - Handling and Storage

**Handling:** Wash thoroughly after handling. Wash thoroughly after handling. Avoid contact with eyes, skin, and clothing. Use only with adequate ventilation. Avoid breathing dust.

**Storage:** Store in a tightly closed container. Store in a cool, dry area away from incompatible substances.

#### Section 8 - Exposure Controls, Personal Protection

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Chrysene	0.2 mg/m <sup>3</sup> TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m <sup>3</sup> TWA	0.2 mg/m <sup>3</sup> TWA (benzene soluble fraction) (listed under Coal tar pitches).

OSHA Vacated PELs: Chrysene: 0.2 mg/m<sup>3</sup> TWA (benzene soluble fraction) (listed under Coal tar pitches)

**Engineering Controls:**

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels.

**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.  
Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a  
Respirators: 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: very light beige

Odor: Not available

pH: Not available

Vapor Pressure: Not available

Vapor Density: Not available

Evaporation Rate: Not available

Viscosity: Not available

Boiling Point: 448 deg C @ 760 mm Hg ( 838.40°F)

Freezing/Melting Point: 250-255 deg C

Decomposition Temperature: Not available

Solubility in water: insoluble

Specific Gravity/Density:

Molecular Formula: C18H12

Molecular Weight: 228.29

#### Section 10 - Stability and Reactivity

Chemical Stability:	Stable under normal temperatures and pressures.
Conditions to Avoid:	Dust generation.
Incompatibilities with Other Materials	Not available
Hazardous Decomposition Products	Carbon monoxide, carbon dioxide.
Hazardous Polymerization	Has not been reported.

#### Section 11 - Toxicological Information

RTECS#:	CAS# 218-01-9: GC0700000
LD50/LC50:	RTECS: Not available.
Carcinogenicity:	Chrysene - ACGIH: A1 - Confirmed Human Carcinogen (Coal tar pitches). California: carcinogen, initial date 1/1/90 NTP: Known carcinogen (Coal tar pitches). IARC: Group 1 carcinogen (Coal tar pitches).
Other:	See actual entry in RTECS for complete information.

#### Section 12 - Ecological Information

Ecotoxicity: Water flea LC50 = 1.9 mg/L; 2 Hr.; Unspecified

#### Section 13 - Disposal Considerations

Dispose of in a manner consistent with federal, state, and local regulations.

#### Section 14 - Transport Information

#### US DOT

Shipping Name: Please contact Fisher Scientific for shipping information

Hazard Class:

UN Number:

Packing Group:

Canada TDG

Shipping Name: Not available

Hazard Class:

UN Number:

Packing Group:

USA RQ: CAS# 218-01-9: 100 lb final RQ; 45.4 kg final RQ

#### Section 15 - Regulatory Information



## European/International Regulations

### European Labeling in Accordance with EC Directives

Hazard Symbols: T

Risk Phrases:

R 45 May cause cancer.

R 50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 53 Avoid exposure - obtain special instructions before use.

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

S 60 This material and its container must be disposed of as hazardous waste.

S 61 Avoid release to the environment. Refer to special instructions/safety data sheets.

WGK (Water Danger/Protection)

CAS# 218-01-9: Not available

Canada

CAS# 218-01-9 is listed on Canada's DSL List

Canadian WHMIS Classifications: 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.

CAS# 218-01-9 is listed on Canada's Ingredient Disclosure List

US Federal

TSCA

CAS# 218-01-9 is listed on the TSCA Inventory.

### Section 16 - Other Information

MSDS Creation Date: 6/30/1999

Revision #6 Date 7/20/2009

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential, or exemplary damages howsoever arising, even if the company has been advised of the possibility of such damages.

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## Safety Data Sheet

Revision Date: 10/02/19

www.restek.com

2 Letter ISO country code/language code: US/EN

### 1. IDENTIFICATION

**Catalog Number / Product Name:** 31276 / Dibenzo(a,h)anthracene Standard  
**Company:** Restek Corporation  
**Address:** 110 Benner Circle  
Bellefonte, Pa. 16823  
**Phone#:** 814-353-1300  
**Fax#:** 814-353-1309  
**Emergency#:** 800-424-9300 (CHEMTREC)  
703-527-3887 (Outside the US)  
**Email:** www.restek.com  
**Revision Number:** 9  
**Intended use:** For Laboratory use only

### 2. HAZARD(S) IDENTIFICATION

#### Emergency Overview:



GHS Hazard Symbols:

**GHS Classification:** Carcinogenicity Category 2

**GHS Signal Word:** Warning

**GHS Hazard:** Suspected of causing cancer.

**GHS Precautions:**

**Safety Precautions:** 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.

**First Aid Measures:** IF exposed or concerned: Get medical advice/attention.

**Storage:** Store locked up.

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

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

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

### 3. COMPOSITION / INFORMATION ON INGREDIENT

Chemical Name	CAS #	EINEC #	% Composition
Dichloromethane	75-09-2	200-838-9	99.9
dibenz (a,h) anthracene	53-70-3	200-181-8	0.1

#### 4. FIRST-AID MEASURES

<b>Inhalation:</b>	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
<b>Eyes:</b>	Immediately flush eyes with plenty of water for at least 20 minutes retracting eyelids often. Tilt the head to prevent chemical from transferring to the uncontaminated eye. Get immediate medical attention and monitor the eye daily as advised by your physician. Serious harm (damage) may result if treatment is delayed. Continue to flush eyes while awaiting medical attention
<b>Skin Contact:</b>	Wash with soap and water. Remove contaminated clothing, launder immediately, and discard contaminated leather goods. Get medical attention immediately.
<b>Ingestion:</b>	Do not induce vomiting and seek medical attention immediately. Drink two glasses of water or milk to dilute. Provide medical care provider with this SDS. Never give anything by mouth to an unconscious person

#### 5. FIRE- FIGHTING MEASURES

<b>Extinguishing Media:</b>	Use alcohol resistant foam, carbon dioxide, or dry chemical when fighting fires. Water or foam may cause frothing if liquid is burning but it still may be a useful extinguishing agent if carefully applied to the surface of the fire. Do Not direct a stream of water into the hot burning liquid. Use methods suitable to fight surrounding fire.
<b>Fire and/or Explosion Hazards:</b>	No data.
<b>Fire Fighting Methods and Protection:</b>	Use methods for the surrounding fire.
<b>Hazardous Combustion Products:</b>	Carbon dioxide, Carbon monoxide

#### 6. ACCIDENTAL RELEASE MEASURES

<b>Personal Precautions and Equipment:</b>	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.
<b>Methods for Clean-up:</b>	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

<b>Handling Technical Measures and Precautions:</b>	Toxic or severely irritating material. Avoid contacting and avoid breathing the material. Use only in a well ventilated area. As with all chemicals, good industrial hygiene practices should be followed when handling this material.
<b>Storage Technical Measures and Conditions:</b>	Store in a cool dry place. Isolate from incompatible materials. Keep container closed when not in use

#### 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

<b>United States:</b>					
<b>Chemical Name</b>	<b>CAS No.</b>	<b>IDLH</b>	<b>ACGIH STEL</b>	<b>ACGIH TLV-TWA</b>	<b>OSHA Exposure Limit</b>
Dichloromethane	75-09-2	2300 ppm IDLH	None Known	50 ppm TWA	25 ppm TWA; 125 ppm STEL (15 min. TWA)
dibenz (a,h) anthracene	53-70-3	Not established	None Known	Not established	No data available

##### **Personal Protection:**

##### **Engineering Measures:**

Local exhaust ventilation or other engineering controls are normally required when handling or using this product to avoid overexposure.

##### **Respiratory Protection:**

Respiratory protection may be required to avoid overexposure when handling this product. General or local exhaust ventilation is the preferred means of protection. Use a respirator if general room ventilation is not available or sufficient to

<b>Eye Protection:</b>	eliminate symptoms. Wear chemically resistant safety glasses with side shields when handling this product. Wear additional eye protection such as chemical splash goggles and/or face shield when the possibility exists for eye contact with splashing or spraying liquid, or airborne material. Do not wear contact lenses. Have an eye wash station available.
<b>Skin Protection:</b>	Avoid skin contact by wearing chemically resistant gloves, an apron and other protective equipment depending upon conditions of use. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work.
<b>Medical Conditions Aggravated By Exposure:</b>	Eye disease Skin disease including eczema and sensitization Respiratory disease including asthma and bronchitis

## 9. PHYSICAL AND CHEMICAL PROPERTIES

<b>Appearance, color:</b>	Colorless
<b>Odor:</b>	Strong
<b>Physical State:</b>	No data available
<b>pH:</b>	Not applicable
<b>Vapor Pressure:</b>	No data available
<b>Vapor Density:</b>	2.93 (air = 1)
<b>Boiling Point (°C):</b>	524 °C Boiling Point
<b>Melting Point (°C):</b>	-96.7 °C
<b>Flash Point (°F):</b>	No data available
<b>Upper Flammable/Explosive Limit, % in air:</b>	No data available
<b>Lower Flammable/Explosive Limit, % in air:</b>	No data available
<b>Autoignition Temperature (°C):</b>	556 deg C
<b>Decomposition Temperature (°C):</b>	No data available
<b>Specific Gravity:</b>	1.3254 - 1.3258 g/cm <sup>3</sup> at 20 °C
<b>Evaporation Rate:</b>	No data available
<b>Odor Threshold:</b>	ND
<b>Solubility:</b>	Moderate; 50-99%
<b>Partition Coefficient: n-octanol in water:</b>	No data available
<b>VOC % by weight:</b>	99.9
<b>Molecular Weight:</b>	No data available

## 10. STABILITY AND REACTIVITY

<b>Stability:</b>	Stable under normal conditions.
<b>Conditions to Avoid:</b>	None known. Contamination High temperatures
<b>Materials to Avoid / Chemical Incompatibility:</b>	Strong oxidizing agents Caustics (bases)
<b>Hazardous Decomposition Products:</b>	Carbon dioxide Carbon monoxide

## 11. TOXICOLOGICAL INFORMATION

<b>Routes of Entry:</b>	Inhalation Absorption Ingestion Skin contact Eye contact
<b>Target Organs Potentially Affected By Exposure:</b>	Skin, Cardiovascular System, Eyes, Liver
<b>Chemical Interactions That Change Toxicity:</b>	None Known

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

<b>Inhalation Irritation:</b>	Can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache.
<b>Inhalation Toxicity:</b>	Harmful! Can cause systemic damage (see "Target Organs") Inhalation may cause severe central nervous system depression (including unconsciousness).
<b>Skin Contact:</b>	Contact causes severe skin irritation and possible burns.
<b>Skin Absorption:</b>	Harmful if absorbed through the skin. May cause severe irritation and systemic damage.
<b>Eye Contact:</b>	Contact with the eyes may cause moderate to severe eye injury. Eye contact may result in tearing and reddening, but not likely to permanently injure eye tissue. Temporary vision impairment (cloudy or blurred vision) is possible.
<b>Ingestion Irritation:</b>	Irritating to mouth, throat, and stomach. Can cause abdominal discomfort, nausea, vomiting and diarrhea.
<b>Ingestion Toxicity:</b>	Harmful if swallowed. May cause systemic poisoning.

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

<b>Carcinogenicity:</b>	Contains a probable or known human carcinogen.
<b>Reproductive and Developmental Toxicity:</b>	No data available to indicate product or any components

**Inhalation:** present at greater than 0.1% may cause birth defects. Upon prolonged and/or repeated exposure, can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache. Harmful! Can cause systemic damage upon prolonged and/or repeated exposure (see "Target Organs")

**Skin Absorption:** Upon prolonged or repeated exposure, harmful if absorbed through the skin. May cause severe irritation and systemic damage

**Component Toxicological Data:**

**NIOSH:**

Chemical Name	CAS No.	LD50/LC50
Methane, dichloro-	75-09-2	Inhalation LC50 Rat 53 mg/L 6 h

**Component Carcinogenic Data:**

**OSHA:**

Chemical Name	CAS No.	
Dibenz[a,h]anthracene	53-70-3	Present
Methylene chloride	75-09-2	25 ppm TWA (8 hr.); 125 ppm STEL (15 min.); 12.5 ppm Action Level (see 29 CFR 1910.1051); effective date for respiratory protection for certain employers to achieve the 8-hour TWA PEL is August 31, 1998; the start up date to install engineering controls is December 10, 1998.; (OSHA - 29 CFR 1910 Specifically Regulate

**ACGIH:**

Chemical Name	CAS No.	
Dichloromethane	75-09-2	A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans

**NIOSH:**

Chemical Name	CAS No.	
Methylene chloride	75-09-2	potential occupational carcinogen

**NTP:**

Chemical Name	CAS No.	
No data available		

**IARC:**

Chemical Name	CAS No.	Group No.
Monograph 92 [2010]; Supplement 7 [1987]; Monograph 32 [1983] (overall evaluation upgraded from 2B to 2A with supporting evidence from other relevant data)	53-70-3	Group 2A
Monograph 110 [in preparation]; Monograph 71 [1999]	75-09-2	Group 2A

**12. ECOLOGICAL INFORMATION**

<b>Overview:</b>	Moderate ecological hazard. This product may be dangerous to plants and/or wildlife. Keep out of waterways.
<b>Mobility:</b>	No data
<b>Persistence:</b>	No data
<b>Bioaccumulation:</b>	No data
<b>Degradability:</b>	No data
<b>Ecological Toxicity Data:</b>	No data available

**13. DISPOSAL CONSIDERATIONS**

<b>Waste Description of Spent Product:</b>	Spent or discarded material is a hazardous waste. Mixing spent or discarded material with other materials may render the mixture hazardous. Perform a hazardous waste determination on mixtures.
--------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

**Disposal Methods:** Incinerate spent or discarded material a permitted hazardous waste facility.  
**Waste Disposal of Packaging:** Comply with all Local, State, Federal, and Provincial Environmental Regulations.

**14. TRANSPORTATION INFORMATION**

**United States:**  
**DOT Proper Shipping Name:** Dichloromethane  
**UN Number:** UN1593  
**Hazard Class:** 6.1  
**Packing Group:** III

**International:**  
**IATA Proper Shipping Name:** Dichloromethane  
**UN Number:** UN1593  
**Hazard Class:** 6.1  
**Packing Group:** III

**Marine Pollutant:** No

Chemical Name	CAS#	Marine Pollutant	Severe Marine Pollutant
No data available			

**15. REGULATORY INFORMATION**

**United States:**

Chemical Name	CAS#	CERCLA	SARA 313	SARA EHS 313	TSCA
Dichloromethane	75-09-2	X	X	-	X
dibenz (a,h) anthracene	53-70-3	X	X	-	X

The following chemicals are listed on CA Prop 65:

Chemical Name	CAS #	Regulation
Dibenz[a,h]anthracene	53-70-3	Prop 65 Cancer
Dichloromethane	75-09-2	Prop 65 Cancer
Dichloromethane (Methylene chloride)		

**State Right To Know Listing:**

Chemical Name	CAS#	New Jersey	Massachusetts	Pennsylvania	California
Dichloromethane	75-09-2	X	X	X	X
dibenz (a,h) anthracene	53-70-3	X	X	X	X

**16. OTHER INFORMATION**

**Prior Version Date:** 06/20/18  
**Other Information:** Any changes to the SDS compared to previous versions are marked by a vertical line in front of the concerned paragraph.  
**References:** No data available  
**Disclaimer:** Restek Corporation provides the descriptions, data and information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. It is provided for your guidance only. Because many factors may affect processing or application/use, Restek Corporation recommends you perform an assessment to determine the suitability of a product for your particular purpose prior to use. No warranties of any kind, either expressed or implied, including fitness for a particular purpose, are made regarding products 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.



## Safety Data Sheet

Revision Date: 06/04/19

www.restek.com

2 Letter ISO country code/language code: US/EN

### 1. IDENTIFICATION

**Catalog Number / Product Name:** 31279 / Indeno(1,2,3-c,d)pyrene Standard  
**Company:** Restek Corporation  
**Address:** 110 Benner Circle  
Bellefonte, Pa. 16823  
**Phone#:** 814-353-1300  
**Fax#:** 814-353-1309  
**Emergency#:** 800-424-9300 (CHEMTREC)  
703-527-3887 (Outside the US)  
**Email:** www.restek.com  
**Revision Number:** 11  
**Intended use:** For Laboratory use only

### 2. HAZARD(S) IDENTIFICATION

#### Emergency Overview:



**GHS Hazard Symbols:**

**GHS Classification:** Carcinogenicity Category 2

**GHS Signal Word:** Warning

**GHS Hazard:** Suspected of causing cancer.

**GHS Precautions:**

**Safety Precautions:** Obtain special instructions before use.  
Do not handle until all safety precautions have been read and understood.  
Wear protective gloves/protective clothing/eye protection/face protection.

**First Aid Measures:** IF exposed or concerned: Get medical advice/attention.

**Storage:** Store locked up.

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

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

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

### 3. COMPOSITION / INFORMATION ON INGREDIENT

Chemical Name	CAS #	EINEC #	% Composition
Dichloromethane	75-09-2	200-838-9	99.9
indeno (1,2,3-c,d) pyrene	193-39-5	205-893-2	0.1

#### 4. FIRST-AID MEASURES

<b>Inhalation:</b>	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
<b>Eyes:</b>	Immediately flush eyes with plenty of water for at least 20 minutes retracting eyelids often. Tilt the head to prevent chemical from transferring to the uncontaminated eye. Get immediate medical attention and monitor the eye daily as advised by your physician. Serious harm (damage) may result if treatment is delayed. Continue to flush eyes while awaiting medical attention
<b>Skin Contact:</b>	Wash with soap and water. Remove contaminated clothing, launder immediately, and discard contaminated leather goods. Get medical attention immediately.
<b>Ingestion:</b>	Do not induce vomiting and seek medical attention immediately. Drink two glasses of water or milk to dilute. Provide medical care provider with this SDS. Never give anything by mouth to an unconscious person

#### 5. FIRE- FIGHTING MEASURES

<b>Extinguishing Media:</b>	Use alcohol resistant foam, carbon dioxide, or dry chemical when fighting fires. Water or foam may cause frothing if liquid is burning but it still may be a useful extinguishing agent if carefully applied to the surface of the fire. Do Not direct a stream of water into the hot burning liquid. Use methods suitable to fight surrounding fire.
<b>Fire and/or Explosion Hazards:</b>	No data.
<b>Fire Fighting Methods and Protection:</b>	Use methods for the surrounding fire.
<b>Hazardous Combustion Products:</b>	Carbon dioxide, Carbon monoxide

#### 6. ACCIDENTAL RELEASE MEASURES

<b>Personal Precautions and Equipment:</b>	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.
<b>Methods for Clean-up:</b>	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

<b>Handling Technical Measures and Precautions:</b>	Toxic or severely irritating material. Avoid contacting and avoid breathing the material. Use only in a well ventilated area. As with all chemicals, good industrial hygiene practices should be followed when handling this material.
<b>Storage Technical Measures and Conditions:</b>	Store in a cool dry place. Isolate from incompatible materials. Keep container closed when not in use

#### 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

##### United States:

Chemical Name	CAS No.	IDLH	ACGIH STEL	ACGIH TLV-TWA	OSHA Exposure Limit
Dichloromethane	75-09-2	2300 ppm IDLH	None Known	50 ppm TWA	25 ppm TWA; 125 ppm STEL (15 min. TWA)
indeno (1,2,3-c,d) pyrene	193-39-5	Not established	None Known	Not established	No data available

##### Personal Protection:

<b>Engineering Measures:</b>	Local exhaust ventilation or other engineering controls are normally required when handling or using this product to avoid overexposure.
<b>Respiratory Protection:</b>	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



<b>Eye Protection:</b>	eliminate symptoms. Wear chemically resistant safety glasses with side shields when handling this product. Wear additional eye protection such as chemical splash goggles and/or face shield when the possibility exists for eye contact with splashing or spraying liquid, or airborne material. Do not wear contact lenses. Have an eye wash station available.
<b>Skin Protection:</b>	Avoid skin contact by wearing chemically resistant gloves, an apron and other protective equipment depending upon conditions of use. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work.
<b>Medical Conditions Aggravated By Exposure:</b>	Eye disease Skin disease including eczema and sensitization Respiratory disease including asthma and bronchitis

## 9. PHYSICAL AND CHEMICAL PROPERTIES

<b>Appearance, color:</b>	Colorless
<b>Odor:</b>	Strong
<b>Physical State:</b>	No data available
<b>pH:</b>	Not applicable
<b>Vapor Pressure:</b>	No data available
<b>Vapor Density:</b>	2.93 (air = 1)
<b>Boiling Point (°C):</b>	530 °C
<b>Melting Point (°C):</b>	-96.7 °C
<b>Flash Point (°F):</b>	No data available
<b>Upper Flammable/Explosive Limit, % in air:</b>	No data available
<b>Lower Flammable/Explosive Limit, % in air:</b>	No data available
<b>Autoignition Temperature (°C):</b>	556 deg C
<b>Decomposition Temperature (°C):</b>	No data available
<b>Specific Gravity:</b>	1.3254 - 1.3258 g/cm <sup>3</sup> at 20 °C
<b>Evaporation Rate:</b>	No data available
<b>Odor Threshold:</b>	ND
<b>Solubility:</b>	Moderate; 50-99%
<b>Partition Coefficient: n-octanol in water:</b>	No data available
<b>VOC % by weight:</b>	99.9
<b>Molecular Weight:</b>	No data available

## 10. STABILITY AND REACTIVITY

<b>Stability:</b>	Stable under normal conditions.
<b>Conditions to Avoid:</b>	None known. Contamination High temperatures
<b>Materials to Avoid / Chemical Incompatibility:</b>	Strong oxidizing agents Caustics (bases)
<b>Hazardous Decomposition Products:</b>	Carbon dioxide Carbon monoxide

## 11. TOXICOLOGICAL INFORMATION

<b>Routes of Entry:</b>	Inhalation Absorption Ingestion Skin contact Eye contact
<b>Target Organs Potentially Affected By Exposure:</b>	Skin, Cardiovascular System, Eyes, Liver
<b>Chemical Interactions That Change Toxicity:</b>	None Known

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

<b>Inhalation Irritation:</b>	Can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache.
<b>Inhalation Toxicity:</b>	Harmful! Can cause systemic damage (see "Target Organs") Inhalation may cause severe central nervous system depression (including unconsciousness).
<b>Skin Contact:</b>	Contact causes severe skin irritation and possible burns.
<b>Skin Absorption:</b>	Harmful if absorbed through the skin. May cause severe irritation and systemic damage.
<b>Eye Contact:</b>	Contact with the eyes may cause moderate to severe eye injury. Eye contact may result in tearing and reddening, but not likely to permanently injure eye tissue. Temporary vision impairment (cloudy or blurred vision) is possible.
<b>Ingestion Irritation:</b>	Irritating to mouth, throat, and stomach. Can cause abdominal discomfort, nausea, vomiting and diarrhea.
<b>Ingestion Toxicity:</b>	Harmful if swallowed. May cause systemic poisoning.

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

<b>Carcinogenicity:</b>	Contains a probable or known human carcinogen.
<b>Reproductive and Developmental Toxicity:</b>	No data available to indicate product or any components

**Inhalation:** present at greater than 0.1% may cause birth defects. Upon prolonged and/or repeated exposure, can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache. Harmful! Can cause systemic damage upon prolonged and/or repeated exposure (see "Target Organs")

**Skin Absorption:** Upon prolonged or repeated exposure, harmful if absorbed through the skin. May cause severe irritation and systemic damage

**Component Toxicological Data:**

**NIOSH:**

Chemical Name	CAS No.	LD50/LC50
Methane, dichloro-	75-09-2	Inhalation LC50 Rat 53 mg/L 6 h

**Component Carcinogenic Data:**

**OSHA:**

Chemical Name	CAS No.	
Indeno[1,2,3-cd]pyrene	193-39-5	Present
Methylene chloride	75-09-2	25 ppm TWA (8 hr.); 125 ppm STEL (15 min.); 12.5 ppm Action Level (see 29 CFR 1910.1051); effective date for respiratory protection for certain employers to achieve the 8-hour TWA PEL is August 31, 1998; the start up date to install engineering controls is December 10, 1998.; (OSHA - 29 CFR 1910 Specifically Regulate

**ACGIH:**

Chemical Name	CAS No.	
Dichloromethane	75-09-2	A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans

**NIOSH:**

Chemical Name	CAS No.	
Methylene chloride	75-09-2	potential occupational carcinogen

**NTP:**

Chemical Name	CAS No.	
No data available		

**IARC:**

Chemical Name	CAS No.	Group No.
Monograph 110 [in preparation]; Monograph 71 [1999]	75-09-2	Group 2A
Monograph 92 [2010]; Supplement 7 [1987]; Monograph 32 [1983]	193-39-5	Group 2B

**12. ECOLOGICAL INFORMATION**

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<b>Overview:</b>	Moderate ecological hazard. This product may be dangerous to plants and/or wildlife. Keep out of waterways.
<b>Mobility:</b>	No data
<b>Persistence:</b>	No data
<b>Bioaccumulation:</b>	No data
<b>Degradability:</b>	No data
<b>Ecological Toxicity Data:</b>	No data available

**13. DISPOSAL CONSIDERATIONS**

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<b>Waste Description of Spent Product:</b>	Spent or discarded material is a hazardous waste. Mixing spent or discarded material with other materials may render the mixture hazardous. Perform a hazardous waste determination on mixtures.
<b>Disposal Methods:</b>	Incinerate spent or discarded material a permitted hazardous waste facility.
<b>Waste Disposal of Packaging:</b>	Comply with all Local, State, Federal, and Provincial

**14. TRANSPORTATION INFORMATION**

**United States:**  
**DOT Proper Shipping Name:** Dichloromethane  
**UN Number:** UN1593  
**Hazard Class:** 6.1  
**Packing Group:** III

**International:**  
**IATA Proper Shipping Name:** Dichloromethane  
**UN Number:** UN1593  
**Hazard Class:** 6.1  
**Packing Group:** III

**Marine Pollutant:** No

Chemical Name	CAS#	Marine Pollutant	Severe Marine Pollutant
No data available			

**15. REGULATORY INFORMATION**

**United States:**

Chemical Name	CAS#	CERCLA	SARA 313	SARA EHS 313	TSCA
Dichloromethane	75-09-2	X	X	-	X
indeno (1,2,3-c,d) pyrene	193-39-5	X	X	-	X

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

Chemical Name	CAS #	Regulation
Indeno[1,2,3-cd]pyrene	193-39-5	Prop 65 Cancer
Dichloromethane Dichloromethane (Methylene chloride)	75-09-2	Prop 65 Cancer

**State Right To Know Listing:**

Chemical Name	CAS#	New Jersey	Massachusetts	Pennsylvania	California
Dichloromethane	75-09-2	X	X	X	X
indeno (1,2,3-c,d) pyrene	193-39-5	X	X	X	X

**16. OTHER INFORMATION**

**Prior Version Date:** 03/22/18

**Other Information:** Any changes to the SDS compared to previous versions are marked by a vertical line in front of the concerned paragraph.

**References:** No data available

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# Lead

## Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations  
Date of issue: 12/15/2014 Revision date: 12/15/2014 Version: 1.1

### SECTION 1: Identification of the substance/mixture and of the company/undertaking

#### 1.1. Product identifier

Product form : Substance  
CAS No : 7439-92-1  
Formula : Pb  
Synonyms : C.I. 77575, in massive state / elemental lead, in massive state / glover, in massive state  
BIG no : 10073

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

Use of the substance/mixture : Solder  
Battery: component  
Construction  
Electrodes

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

GSC International, Inc.  
1747 N. Deffer Drive  
Nixa,  
MO 65714  
United States of America

Tel: 417-374-7431  
Fax: 417-374-7442  
Email: info@gsccinternationalinc.com

#### 1.4. Emergency telephone number

Country	Organization/Company	Address	Emergency number
MEXICO	Servicio de Informacion Toxicologica Sintox	Tintoreto #32 Edif. a Desp. Col. Nochebuena Mixcoac México, D.F.	1 800 009 2800 +52 55 5611 2634 /+52 55 5598 9095
UNITED STATES OF AMERICA	American Association of Poison Control Centers		1-800-222-1222

### SECTION 2: Hazards identification

#### 2.1. Classification of the substance or mixture

##### Classification (GHS-US)

Acute Tox. 4 (Oral) H302  
Acute Tox. 4 (Inhalation) H332  
Carc. 1B H350  
Repr. 1A H360  
STOT RE 2 H373  
Aquatic Acute 1 H400  
Aquatic Chronic 1 H410

Full text of H-phrases: see section 16

#### 2.2. Label elements

##### GHS-US labeling

Hazard pictograms (GHS-US) :



GHS07

GHS08

GHS09

Signal word (GHS-US) :

Danger

Hazard statements (GHS-US) :

H302+H332 - Harmful if swallowed or if inhaled  
H350 - May cause cancer  
H360 - May damage fertility or the unborn child  
H373 - May cause damage to organs through prolonged or repeated exposure

# Lead

## Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

H400 - Very toxic to aquatic life  
H410 - Very toxic to aquatic life with long lasting effects

Precautionary statements (GHS-US) :

- P201 - Obtain special instructions before use
- P202 - Do not handle until all safety precautions have been read and understood
- P260 - Do not breathe dust, fume
- P264 - Wash hands thoroughly after handling
- P270 - Do not eat, drink or smoke when using this product
- P273 - Avoid release to the environment
- P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
- P308+P313 - If exposed or concerned: Get medical advice/attention
- P314 - Get medical advice/attention if you feel unwell
- P501 - Dispose of contents/container to a licensed hazardous-waste disposal contractor or collection site except for empty clean containers which can be disposed of as non-hazardous waste

### 2.3. Other hazards

No additional information available

### 2.4. Unknown acute toxicity (GHS-US)

Not applicable

## SECTION 3: Composition/information on ingredients

### 3.1. Substance

Name	Product identifier	%	Classification (GHS-US)
Lead (Main constituent)	(CAS No) 7439-92-1	> 99,9	Acute Tox. 4 (Oral), H302 Acute Tox. 4 (Inhalation), H332 Carc. 1B, H350 Repr. 1A, H360 STOT RE 2, H373 Aquatic Acute 1, H400 Aquatic Chronic 1, H410

Full text of H-phrases: see section 16

### 3.2. Mixture

Not applicable

### 4.1. Description of first aid measures

First-aid measures general : If you feel unwell, seek medical advice. IF exposed or concerned: Get medical advice/attention. Call a poison center/doctor/physician if you feel unwell.

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. Not applicable. Call a poison center/doctor/physician if you feel unwell.

First-aid measures after skin contact : Not applicable. Wash skin with plenty of water.

First-aid measures after eye contact : Not applicable. Rinse eyes with water as a precaution.

First-aid measures after ingestion : Not applicable. Rinse mouth. Call a poison center/doctor/physician if you feel unwell.

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

Symptoms/injuries after inhalation : No effects known.

Symptoms/injuries after skin contact : No effects known.

Symptoms/injuries after eye contact : No effects known.

Symptoms/injuries after ingestion : No effects known.

Chronic symptoms : No effects known.

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

Treat symptomatically.

## SECTION 5: Firefighting measures

### 5.1. Extinguishing media

Suitable extinguishing media : Adapt extinguishing media to the environment.

Unsuitable extinguishing media : No unsuitable extinguishing media known.

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

Fire hazard : DIRECT FIRE HAZARD. Non combustible.

# Lead

## Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

- Explosion hazard : DIRECT EXPLOSION HAZARD. No data available on direct explosion hazard. INDIRECT EXPLOSION HAZARD. No data available on indirect explosion hazard.
- Reactivity : On burning: formation of metallic fumes. Oxidizes on exposure to air.

### 5.3. Advice for firefighters

- Precautionary measures fire : Exposure to fire/heat: keep upwind. Exposure to fire/heat: consider evacuation. Exposure to heat: have neighborhood close doors and windows.
- Firefighting instructions : Dilute toxic gases with water spray. Take account of toxic fire-fighting water. Use water moderately and if possible collect or contain it.
- Protection during firefighting : Heat/fire exposure: compressed air/oxygen apparatus. Do not attempt to take action without suitable protective equipment. Self-contained breathing apparatus. Complete protective clothing.

## SECTION 6: Accidental release measures

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

#### 6.1.1. For non-emergency personnel

- Protective equipment : Gloves. Protective clothing. See "Material-Handling" to select protective clothing.
- Emergency procedures : Mark the danger area. No naked flames.

#### 6.1.2. For emergency responders

- Protective equipment : Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

### 6.2. Environmental precautions

Avoid release to the environment. Prevent soil and water pollution. Prevent spreading in sewers. Notify authorities if product enters sewers or public waters.

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

- For containment : Not applicable. Collect spillage.
- Methods for cleaning up : Recover mechanically the product. Pick-up the material. Take collected spill to manufacturer/competent authority. Notify authorities if product enters sewers or public waters.
- Other information : Dispose of materials or solid residues at an authorized site.

### 6.4. Reference to other sections

For further information refer to section 13.

## SECTION 7: Handling and storage

### 7.1. Precautions for safe handling

- Precautions for safe handling : Meet the legal requirements. Do not discharge the waste into the drain. Handle unclean empty containers as full ones. Observe strict hygiene. Measure the concentration in the atmosphere. Carry out operations in the open/under local exhaust/ventilation or with respiratory protection. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not breathe dust, fume. Use only outdoors or in a well-ventilated area. Take all necessary technical measures to avoid or minimize the release of the product on the workplace. Limit quantities of product at the minimum necessary for handling and limit the number of exposed workers. Provide local exhaust or general room ventilation. Wear personal protective equipment. Floors, walls and other surfaces in the hazard area must be cleaned regularly.
- Hygiene measures : Separate working clothes from town clothes. Launder separately. Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

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

- Technical measures : Does not require any specific or particular technical measures. Comply with applicable regulations.
- Storage conditions : Store locked up. Store in a well-ventilated place. Keep cool.
- Incompatible materials : Strong acids, strong bases and oxidation agents.
- Heat-ignition : KEEP SUBSTANCE AWAY FROM: heat sources.
- Prohibitions on mixed storage : KEEP SUBSTANCE AWAY FROM: oxidizing agents. Strong acids. Strong bases.
- Storage area : Meet the legal requirements.
- Special rules on packaging : SPECIAL REQUIREMENTS: closing. correctly labeled. meet the legal requirements. Secure fragile packaging in solid containers.

# Lead

## Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

### 7.3. Specific end use(s)

No additional information available

## SECTION 8: Exposure controls/personal protection

### 8.1. Control parameters

Lead (7439-92-1)		
ACGIH	ACGIH TWA (mg/m <sup>3</sup> )	0,05 mg/m <sup>3</sup>
ACGIH	Remark (ACGIH)	CNS & PNS impair
OSHA	Not applicable	

### 8.2. Exposure controls

Appropriate engineering controls : Provide adequate general and local exhaust ventilation. Ensure good ventilation of the work station.

Personal protective equipment : Protective goggles. Gloves.



Materials for protective clothing : GIVE EXCELLENT RESISTANCE: No data available. GIVE GOOD RESISTANCE: butyl rubber. PVC. GIVE LESS RESISTANCE: No data available. GIVE POOR RESISTANCE: No data available.

Hand protection : protective gloves.

Eye protection : Safety glasses.

Skin and body protection : Not required for normal conditions of use.

Respiratory protection : Wear respiratory protection.

Environmental exposure controls : Avoid release to the environment.

## SECTION 9: Physical and chemical properties

### 9.1. Information on basic physical and chemical properties

Physical state	: Solid
Appearance	: Metal.
Molecular mass	: 207,20 g/mol
Color	: White to blue-grey
Odor	: Odorless
Odor threshold	: No data available
pH	: No data available
Relative evaporation rate (butyl acetate=1)	: No data available
Melting point	: 327 °C
Freezing point	: No data available
Boiling point	: 1740 °C
Flash point	: Not applicable
Auto-ignition temperature	: No data available
Decomposition temperature	: No data available
Flammability (solid, gas)	: No data available
Vapor pressure	: < 0,1 hPa
Relative vapor density at 20 °C	: No data available
Relative density	: 11,3
Specific gravity / density	: 11340 kg/m <sup>3</sup>
Solubility	: insoluble in water. Substance sinks in water. Soluble in nitric acid. Insoluble in organic solvents. Water: < 0,1 g/100ml
Log Pow	: 0,73 (Estimated value)
Log Kow	: No data available

# Lead

## Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Viscosity, kinematic	: Not applicable
Viscosity, dynamic	: No data available
Explosive properties	: No data available
Oxidizing properties	: No data available
Explosive limits	: No data available

### 9.2. Other information

VOC content	: Not applicable (inorganic)
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## SECTION 10: Stability and reactivity

### 10.1. Reactivity

On burning: formation of metallic fumes. Oxidizes on exposure to air.

### 10.2. Chemical stability

Unstable on exposure to air.

### 10.3. Possibility of hazardous reactions

No additional information available

### 10.4. Conditions to avoid

No additional information available

### 10.5. Incompatible materials

Acids. Bases.

### 10.6. Hazardous decomposition products

Thermal decomposition generates : fume.

## SECTION 11: Toxicological information

### 11.1. Information on toxicological effects

Acute toxicity : Oral: Harmful if swallowed. Inhalation: Harmful if inhaled.

Lead (Pb) 7439-92-1	
LD50 oral rat	> 2000 mg/kg body weight (Rat; Weight of evidence)
LD50 dermal rat	> 2000 mg/kg body weight (Rat; Experimental value; OECD 402: Acute Dermal Toxicity)
ATE US (oral)	500,000 mg/kg body weight
ATE US (gases)	4500,000 ppmV/4h
ATE US (vapors)	11,000 mg/l/4h
ATE US (dust, mist)	1,500 mg/l/4h
Additional information	Lead massive metal is not considered to be acutely toxic. It is not easily inhaled or ingested, and if it is accidentally ingested normally passes through the gastrointestinal system without significant absorption into the body. Lead is not easily absorbed through the skin.

Skin corrosion/irritation	: Not classified (Based on available data, the classification criteria are not met)
Serious eye damage/irritation	: Not classified (Based on available data, the classification criteria are not met)
Respiratory or skin sensitization	: Not classified (Based on available data, the classification criteria are not met)
Germ cell mutagenicity	: Not classified (Based on available data, the classification criteria are not met)
Carcinogenicity	: May cause cancer.



# Lead

## Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Lead (7439-92-1)	
Additional information	There is some evidence that inorganic lead compounds may have a carcinogenic effect, and they have been classified by IARC as probably carcinogenic to humans. However, it is considered that this classification does not apply to lead in articles, given the very low bioavailability of metallic lead. Carcinogenicity studies of lead metal powder have been negative. Epidemiology studies of workers exposed to inorganic lead compounds have found a limited association with stomach cancer. IARC has concluded that lead metal is possibly carcinogenic to humans (Group aB).
IARC group	2B - Possibly carcinogenic to humans
National Toxicology Program (NTP) Status	3 - Reasonably anticipated to be Human Carcinogen

Reproductive toxicity	: May damage fertility or the unborn child.
Specific target organ toxicity (single exposure)	: Not classified (Based on available data, the classification criteria are not met)
Specific target organ toxicity (repeated exposure)	: May cause damage to organs through prolonged or repeated exposure.

Lead (7439-92-1)	
Additional information	Lead is a cumulative poison and may be absorbed into the body through ingestion or inhalation. Although inhalation and ingestion of lead in massive form are unlikely, poor hygiene practises may result in hand to mouth transfer which maybe significant over a prolonged period of time. Inorganic lead compounds have been documented in observational human studies to produce toxicity in multiple organ systems and body function including the haemotopoetic (blood) system, kidney function, reproductive function and the central nervous system.

Aspiration hazard	: Not classified (Based on available data, the classification criteria are not met)
Symptoms/injuries after inhalation	: No effects known.
Symptoms/injuries after skin contact	: No effects known.
Symptoms/injuries after eye contact	: No effects known.
Symptoms/injuries after ingestion	: No effects known.
Chronic symptoms	: No effects known.

## SECTION 12: Ecological information

### 12.1. Toxicity

Ecology - general	: Dangerous for the environment. Very toxic to aquatic life with long lasting effects.
Ecology - air	: Not dangerous for the ozone layer (Regulation (EC) No 1005/2009). Not included in the list of fluorinated greenhouse gases (Regulation (EC) No 842/2006). TA-Luft Klasse 5.2.2/II.
Ecology - water	: No water pollutant (surface water). Maximum concentration in drinking water: 0.010 mg/l (lead) (Directive 98/83/EC). Highly toxic to aquatic organisms.

Lead (7439-92-1)	
LC50 fish 1	2,8 (0,44 - 542) mg/l (96h) Coughlan, D.J., S.P. Gloss, and J. Kubota 1986. Acute and Sub-Chronic Toxicity of Lead to the Early Life Stages of Small mouth Bass ( <i>Micropterus dolomieu</i> ). <i>Water Air Soil Pollut.</i> 28(3/4):265-275
EC50 Daphnia 1	4,46 (0,53 - 5,1) mg/l (48h) Govindarajan, S., C.P. Valsaraj, R. Mohan, V. Hariprasad, and R. Ramasubramanian 1993. Toxicity of Heavy Metals in Aquaculture Organisms: <i>Penaeus indicus</i> , <i>Perna viridis</i> , <i>Artemia salina</i> and <i>Skeletonema costatum</i> . <i>Pollut.Res.</i> 12(3):187-189

### 12.2. Persistence and degradability

Lead (7439-92-1)	
Persistence and degradability	Biodegradability: Not applicable. No (test)data available on mobility of the substance.
ThOD	Not applicable (inorganic)

### 12.3. Bioaccumulative potential

Lead (7439-92-1)	
Log Pow	0,73 (Estimated value)
Bioaccumulative potential	Low bioaccumulation potential (Log Kow < 4).

### 12.4. Mobility in soil

No additional information available

# Lead

## Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

### 12.5. Other adverse effects

Effect on ozone layer :

## SECTION 13: Disposal considerations

### 13.1. Waste treatment methods

Waste disposal recommendations : Dispose in a safe manner in accordance with local/national regulations. Hazardous waste shall not be mixed together with other waste. Different types of hazardous waste shall not be mixed together if this may entail a risk of pollution or create problems for the further management of the waste. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals. Reuse or recycle following decontamination. Remove to an authorized dump (Class I). Do not discharge into surface water (2000/60/EC, Council decision 2455/2001/EC, O.J. L331 of 15/12/2001).

Additional information : LWCA (the Netherlands): KGA category 05. Hazardous waste according to Directive 2008/98/EC.

## SECTION 14: Transport information

In accordance with DOT

Transport document description : UN3077 Environmentally hazardous substances, solid, n.o.s. Lead(7439-92-1), 9, III

UN-No.(DOT) : UN3077

Proper Shipping Name (DOT) : Environmentally hazardous substances, solid, n.o.s.  
Lead(7439-92-1)

Department of Transportation (DOT) Hazard Classes : 9 - Class 9 - Miscellaneous hazardous material 49 CFR 173.140

Hazard labels (DOT) : 9 - Class 9 (Miscellaneous dangerous materials)



DOT Symbols : G - Identifies PSN requiring a technical name

Packing group (DOT) : III - Minor Danger

# Lead

## Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

DOT Special Provisions (49 CFR 172.102)	: 8 - A hazardous substance that is not a hazardous waste may be shipped under the shipping description "Other regulated substances, liquid or solid, n.o.s.", as appropriate. In addition, for solid materials, special provision B54 applies. 146 - This description may be used for a material that poses a hazard to the environment but does not meet the definition for a hazardous waste or a hazardous substance, as defined in 171.8 of this subchapter, or any hazard class as defined in Part 173 of this subchapter, if it is designated as environmentally hazardous by the Competent Authority of the country of origin, transit or destination. 335 - Mixtures of solids that are not subject to this subchapter and environmentally hazardous liquids or solids may be classified as "Environmentally hazardous substances, solid, n.o.s.," UN3077 and may be transported under this entry, provided there is no free liquid visible at the time the material is loaded or at the time the packaging or transport unit is closed. Each transport unit must be leak-proof when used as bulk packaging. A112 - Notwithstanding the quantity limits shown in Column (9A) and (9B) for this entry, the following IBCs are authorized for transportation aboard passenger and cargo-only aircraft. Each IBC may not exceed a maximum net quantity of 1,000 kg: a. Metal: 11A, 11B, 11N, 21A, 21B and 21N b. Rigid plastics: 11H1, 11H2, 21H1 and 21H2 c. Composite with plastic inner receptacle: 11HZ1, 11HZ2, 21HZ1 and 21HZ2 d. Fiberboard: 11G e. Wooden: 11C, 11D and 11F (with inner liners) f. Flexible: 13H2, 13H3, 13H4, 13H5, 13L2, 13L3, 13L4, 13M1 and 13M2 (flexible IBCs must be sift-proof and water resistant or must be fitted with a sift-proof and water resistant liner). B54 - Open-top, sift-proof rail cars are also authorized. IB8 - Authorized IBCs: Metal (11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B and 31N); Rigid plastics (11H1, 11H2, 21H1, 21H2, 31H1 and 31H2); Composite (11HZ1, 11HZ2, 21HZ1, 21HZ2, 31HZ1 and 31HZ2); Fiberboard (11G); Wooden (11C, 11D and 11F); Flexible (13H1, 13H2, 13H3, 13H4, 13H5, 13L1, 13L2, 13L3, 13L4, 13M1 or 13M2). IP3 - Flexible IBCs must be sift-proof and water-resistant or must be fitted with a sift-proof and water-resistant liner. N20 - A 5M1 multi-wall paper bag is authorized if transported in a closed transport vehicle. T1 - 1.5 178.274(d)(2) Normal..... 178.275(d)(2) TP33 - The portable tank instruction assigned for this substance applies for granular and powdered solids and for solids which are filled and discharged at temperatures above their melting point which are cooled and transported as a solid mass. Solid substances transported or offered for transport above their melting point are authorized for transportation in portable tanks conforming to the provisions of portable tank instruction T4 for solid substances of packing group III or T7 for solid substances of packing group II, unless a tank with more stringent requirements for minimum shell thickness, maximum allowable working pressure, pressure-relief devices or bottom outlets are assigned in which case the more stringent tank instruction and special provisions shall apply. Filling limits must be in accordance with portable tank special provision TP3. Solids meeting the definition of an elevated temperature material must be transported in accordance with the applicable requirements of this subchapter.
DOT Packaging Exceptions (49 CFR 173.xxx)	: 155
DOT Packaging Non Bulk (49 CFR 173.xxx)	: 213
DOT Packaging Bulk (49 CFR 173.xxx)	: 240
DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27)	: No limit
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75)	: No limit
DOT Vessel Stowage Location	: A - The material may be stowed "on deck" or "under deck" on a cargo vessel and on a passenger vessel.

### Additional information

Other information : No supplementary information available.

### ADR

No additional information available

### Transport by sea

UN-No. (IMDG)	: 3077
Proper Shipping Name (IMDG)	: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Class (IMDG)	: 9 - Miscellaneous dangerous compounds
Packing group (IMDG)	: III - substances presenting low danger

# Lead

## Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

### Air transport

UN-No.(IATA) : 3077  
Proper Shipping Name (IATA) : Environmentally hazardous substance, solid, n.o.s.  
Class (IATA) : 9 - Miscellaneous Dangerous Goods  
Packing group (IATA) : III - Minor Danger

## SECTION 15: Regulatory information

### 15.1. US Federal regulations

#### Lead (7439-92-1)

Listed on the United States TSCA (Toxic Substances Control Act) inventory  
Listed on United States SARA Section 313  
Not listed on the United States SARA Section 313

RQ (Reportable quantity, section 304 of EPA's List of Lists)	10 lb
--------------------------------------------------------------	-------

### 15.2. International regulations

#### CANADA

No additional information available

#### EU-Regulations

No additional information available

#### Classification according to Regulation (EC) No. 1272/2008 [CLP]

Repr. 1A H360Df  
Acute Tox. 4 (Inhalation) H332  
Acute Tox. 4 (Oral) H302  
STOT RE 2 H373  
Aquatic Acute 1 H400  
Aquatic Chronic 1 H410  
Full text of H-phrases: see section 16

#### Classification according to Directive 67/548/EEC [DSD] or 1999/45/EC [DPD]

Repr.Cat.1; R61  
Repr.Cat.3; R62  
Xn; R20/22  
R33  
N; R50/53

Full text of R-phrases: see section 16

### 15.2.2. National regulations

#### Lead (7439-92-1)

Listed on IARC (International Agency for Research on Cancer)  
Listed as carcinogen on NTP (National Toxicology Program)

### 15.3. US State regulations

No additional information available

## SECTION 16: Other information

Revision date : 12/15/2014

# Lead

## Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

### Full text of H-phrases:

Acute Tox. 4 (Inhalation)	Acute toxicity (inhalation) Category 4
Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Aquatic Acute 1	Hazardous to the aquatic environment - Acute Hazard Category 1
Aquatic Chronic 1	Hazardous to the aquatic environment - Chronic Hazard Category 1
Carc. 1B	Carcinogenicity Category 1B
Repr. 1A	Reproductive toxicity Category 1A
STOT RE 2	Specific target organ toxicity (repeated exposure) Category 2
H302	Harmful if swallowed
H332	Harmful if inhaled
H350	May cause cancer
H360	May damage fertility or the unborn child
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

### NFPA health hazard

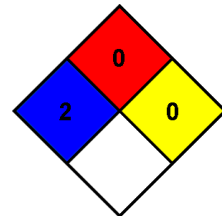
: 2 - Intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical attention is given.

### NFPA fire hazard

: 0 - Materials that will not burn.

### NFPA reactivity

: 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.



### HMIS III Rating

Health : \* Chronic Hazard - Chronic (long-term) health effects may result from repeated overexposure

Flammability : 0 Minimal Hazard

Physical : 0 Minimal Hazard

Personal Protection : B

### SDS US (GHS HazCom 2012)

*This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product*

## SAFETY DATA SHEET

Creation Date 20-Aug-2014

Revision Date 17-Jan-2018

Revision Number 3

### 1. Identification

**Product Name** Mercury (Certified ACS)  
**Cat No. :** M141-1LB; M141-6LB  
**Synonyms** Colloidal mercury; Hydrargyrum; Metallic mercury  
**Recommended Use** Laboratory chemicals.  
**Uses advised against** Not for food, drug, pesticide or biocidal product use

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

##### Company

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

##### **Emergency Telephone Number**

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

### 2. Hazard(s) identification

#### **Classification**

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

Corrosive to metals	Category 1
Acute Inhalation Toxicity - Vapors	Category 2
Reproductive Toxicity	Category 1B
Specific target organ toxicity - (repeated exposure)	Category 1
Target Organs - Central nervous system (CNS), Kidney.	

#### **Label Elements**

##### **Signal Word**

Danger

##### **Hazard Statements**

May be corrosive to metals  
Fatal if inhaled  
May damage the unborn child  
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  
 Do not get in eyes, on skin, or on clothing  
 Wash face, hands and any exposed skin thoroughly after handling  
 Do not eat, drink or smoke when using this product  
 Do not breathe dust/fume/gas/mist/vapors/spray  
 Use only outdoors or in a well-ventilated area  
 Wear respiratory protection

#### Response

IF exposed or concerned: Get medical attention/advice

#### Inhalation

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing  
 Immediately call a POISON CENTER or doctor/physician

#### Skin

Immediately call a POISON CENTER or doctor/physician  
 IF ON SKIN: Gently wash with plenty of soap and water  
 Remove/Take off immediately all contaminated clothing  
 Wash contaminated clothing before reuse

#### Storage

Store locked up  
 Store in a well-ventilated place. Keep container tightly closed

#### Disposal

Dispose of contents/container to an approved waste disposal plant

#### Hazards not otherwise classified (HNOC)

Very toxic to aquatic life with long lasting effects

**WARNING.** Reproductive Harm - <https://www.p65warnings.ca.gov/>.

## 3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Mercury	7439-97-6	100

## 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 soap and plenty of water while removing all contaminated clothes and shoes. Immediate medical attention is required.

#### Inhalation

Move to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Immediate medical attention is required.

#### Ingestion

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

<b>Most important symptoms and effects</b>	No information available.
<b>Notes to Physician</b>	Treat symptomatically

## 5. Fire-fighting measures

<b>Suitable Extinguishing Media</b>	Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.
<b>Unsuitable Extinguishing Media</b>	No information available
<b>Flash Point</b>	No information available
<b>Method -</b>	No information available
<b>Autoignition Temperature</b>	No information available
<b>Explosion Limits</b>	
<b>Upper</b>	No data available
<b>Lower</b>	No data available
<b>Sensitivity to Mechanical Impact</b>	No information available
<b>Sensitivity to Static Discharge</b>	No information available

### Specific Hazards Arising from the Chemical

Very toxic. Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes. Keep product and empty container away from heat and sources of ignition.

### Hazardous Combustion Products

Mercury oxide Highly toxic fumes

### Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

### NFPA

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

## 6. Accidental release measures

<b>Personal Precautions</b>	Wear self-contained breathing apparatus and protective suit. Evacuate personnel to safe areas. Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing.
<b>Environmental Precautions</b>	Should not be released into the environment. See Section 12 for additional ecological information.
<b>Methods for Containment and Clean Up</b>	Wear self-contained breathing apparatus and protective suit. Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

## 7. Handling and storage

<b>Handling</b>	Use only under a chemical fume hood. Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Do not breathe vapors or spray mist. Do not ingest.
<b>Storage</b>	Keep containers tightly closed in a dry, cool and well-ventilated place. Corrosives area.

## 8. Exposure controls / personal protection

### Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Mercury	TWA: 0.025 mg/m <sup>3</sup> Skin	(Vacated) TWA: 0.05 mg/m <sup>3</sup> Ceiling: 0.1 mg/m <sup>3</sup> (Vacated) STEL: 0.03 mg/m <sup>3</sup> Skin (Vacated) Ceiling: 0.1 mg/m <sup>3</sup>	IDLH: 10 mg/m <sup>3</sup> TWA: 0.05 mg/m <sup>3</sup> Ceiling: 0.1 mg/m <sup>3</sup>	TWA: 0.05 mg/m <sup>3</sup>



Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

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

**Engineering Measures** Use only under a chemical fume hood. Ensure 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

<b>Physical State</b>	Liquid
<b>Appearance</b>	Silver
<b>Odor</b>	Odorless
<b>Odor Threshold</b>	No information available
<b>pH</b>	No information available
<b>Melting Point/Range</b>	-38.87 °C / -38 °F
<b>Boiling Point/Range</b>	356.72 °C / 674.1 °F
<b>Flash Point</b>	No information available
<b>Evaporation Rate</b>	No information available
<b>Flammability (solid,gas)</b>	No information available
<b>Flammability or explosive limits</b>	
<b>Upper</b>	No data available
<b>Lower</b>	No data available
<b>Vapor Pressure</b>	0.002 mmHg @ 25 °C
<b>Vapor Density</b>	7.0
<b>Specific Gravity</b>	13.59 (H <sub>2</sub> O=1)
<b>Solubility</b>	Insoluble in water
<b>Partition coefficient; n-octanol/water</b>	No data available
<b>Autoignition Temperature</b>	No information available
<b>Decomposition Temperature</b>	No information available
<b>Viscosity</b>	No information available
<b>Molecular Formula</b>	Hg
<b>Molecular Weight</b>	200.59

## 10. Stability and reactivity

<b>Reactive Hazard</b>	None known, based on information available
<b>Stability</b>	Stable under normal conditions.
<b>Conditions to Avoid</b>	Incompatible products. Excess heat.
<b>Incompatible Materials</b>	Strong oxidizing agents, Ammonia, Metals, Halogens

**Hazardous Decomposition Products** Mercury oxide, Highly toxic fumes

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

**Hazardous Reactions** None under normal processing.

## 11. Toxicological information

### Acute Toxicity

**Product Information** No acute toxicity information is available for this product

**Component Information**

**Toxicologically Synergistic Products** No information available

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

**Irritation** 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
Mercury	7439-97-6	Not listed	Not listed	Not listed	Not listed	Not listed

**Mutagenic Effects** No information available

**Reproductive Effects** No information available.

**Developmental Effects** May cause harm to the unborn child.

**Teratogenicity** No information available.

**STOT - single exposure** None known

**STOT - repeated exposure** Central nervous system (CNS) Kidney

**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

This product contains the following substance(s) which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Mercury	Not listed	0.9 mg/L LC50 96h 0.18 mg/L LC50 96h 0.16 mg/L LC50 96h 0.5 mg/L LC50 96h	Not listed	EC50: = 5.0 µg/L, 96h (water flea)

**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.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Mercury - 7439-97-6	U151	-

## 14. Transport information

**DOT**

UN-No UN2809  
 Proper Shipping Name MERCURY  
 Hazard Class 8  
 Subsidiary Hazard Class 6.1  
 Packing Group III

**TDG**

UN-No UN2809  
 Proper Shipping Name MERCURY  
 Hazard Class 8  
 Subsidiary Hazard Class 6.1  
 Packing Group III

**IATA**

UN-No UN2809  
 Proper Shipping Name MERCURY  
 Hazard Class 8  
 Subsidiary Hazard Class 6.1  
 Packing Group III

**IMDG/IMO**

UN-No UN2809  
 Proper Shipping Name MERCURY  
 Hazard Class 8  
 Subsidiary Hazard Class 6.1  
 Packing Group III

## 15. Regulatory information

**International Inventories**

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Mercury	X	X	-	231-106-7	-		X	-	X	X	X

**Legend:**

X - Listed

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

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

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

P - Indicates a commenced PMN substance

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

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

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

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

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

Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

**U.S. Federal Regulations****TSCA 12(b)**

Component	TSCA 12(b)
Mercury	Section 5

**SARA 313**

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Mercury	7439-97-6	100	1.0

**SARA 311/312 Hazard Categories** See section 2 for more information

**CWA (Clean Water Act)**

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Mercury	-	-	X	X

**Clean Air Act**

Component	HAPS Data	Class 1 Ozone Depleters	Class 2 Ozone Depleters
Mercury	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
Mercury	1 lb	-

**California Proposition 65** This product contains the following proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Mercury	7439-97-6	Developmental	-	Developmental

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

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Mercury	X	X	X	X	X

**U.S. Department of Transportation**

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

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

This product does not contain any DHS chemicals.

**Other International Regulations**

**Mexico - Grade** No information available

## 16. Other information

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

**Creation Date** 20-Aug-2014

**Revision Date** 17-Jan-2018

**Print Date** 17-Jan-2018

**Revision Summary** This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

**Disclaimer**

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

**End of SDS**

# SAFETY DATA SHEET

## Trichloroethylene

### Section 1. Identification

<b>GHS product identifier</b>	: Trichloroethylene
<b>Chemical name</b>	: trichloroethylene
<b>Other means of identification</b>	: trichloroethene; Ethene, 1,1,2-trichloro-; Ethene, trichloro-; Trichlorethylene; Ethylene, trichloro-
<b>Product use</b>	: Synthetic/Analytical chemistry.
<b>Synonym</b>	: trichloroethene; Ethene, 1,1,2-trichloro-; Ethene, trichloro-; Trichlorethylene; Ethylene, trichloro-
<b>SDS #</b>	: 001206
<b>Supplier's details</b>	: Airgas USA, LLC and its affiliates 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
<b>24-hour telephone</b>	: 1-866-734-3438

### Section 2. Hazards identification

<b>OSHA/HCS status</b>	: This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
<b>Classification of the substance or mixture</b>	: SKIN CORROSION/IRRITATION - Category 2 SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2A GERM CELL MUTAGENICITY - Category 2 CARCINOGENICITY - Category 1 AQUATIC HAZARD (LONG-TERM) - Category 3

#### GHS label elements

##### Hazard pictograms



**Signal word** : Danger

**Hazard statements** : Causes serious eye irritation.  
Causes skin irritation.  
May cause cancer.  
Suspected of causing genetic defects.  
Harmful to aquatic life with long lasting effects.

#### Precautionary statements

<b>General</b>	: Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand.
<b>Prevention</b>	: Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves. Wear eye or face protection. Wear protective clothing. Avoid release to the environment. Wash hands thoroughly after handling.
<b>Response</b>	: IF exposed or concerned: Get medical attention. IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing and wash it before reuse. If skin irritation occurs: Get medical attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.
<b>Storage</b>	: Store locked up.
<b>Disposal</b>	: Dispose of contents and container in accordance with all local, regional, national and international regulations.

## Section 2. Hazards identification

**Hazards not otherwise classified** : None known.

## Section 3. Composition/information on ingredients

**Substance/mixture** : Substance  
**Chemical name** : trichloroethylene  
**Other means of identification** : trichloroethene; Ethene, 1,1,2-trichloro-; Ethene, trichloro-; Trichlorethylene; Ethylene, trichloro-

### CAS number/other identifiers

**CAS number** : 79-01-6  
**Product code** : 001206

Ingredient name	%	CAS number
trichloroethylene	100	79-01-6

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

**There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.**

Occupational exposure limits, if available, are listed in Section 8.

## Section 4. First aid measures

### Description of necessary first aid measures

- Eye contact** : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.
- Inhalation** : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If 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. 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. 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** : No known significant effects or critical hazards.

## Section 4. First aid measures

### 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** : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.
- Specific treatments** : No specific treatment.
- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. 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 an extinguishing agent suitable for the surrounding fire.
- Unsuitable extinguishing media** : None known.

**Specific hazards arising from the chemical** : In a fire or if heated, a pressure increase will occur and the container may burst. 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.

**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.

**Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

## Section 6. Accidental release measures

### Personal precautions, protective equipment and emergency procedures

- For non-emergency personnel** : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.
- For emergency responders** : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".



## Section 6. Accidental release measures

**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). Water polluting material. May be harmful to the environment if released in large quantities.

### Methods and materials for containment and cleaning up

- Small spill** : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.
- Large spill** : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

## Section 7. Handling and storage

### Precautions for safe handling

- Protective measures** : Put on appropriate personal protective equipment (see Section 8). 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 ingest. Avoid breathing vapor or mist. Avoid release to the environment. 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.
- Advice on general occupational hygiene** : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

**Conditions for safe storage, including any incompatibilities** : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. 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

trichloroethylene

#### ACGIH TLV (United States, 3/2016).

STEL: 25 ppm 15 minutes.

TWA: 10 ppm 8 hours.

#### OSHA PEL 1989 (United States, 3/1989).

STEL: 1080 mg/m<sup>3</sup> 15 minutes.

STEL: 200 ppm 15 minutes.

TWA: 270 mg/m<sup>3</sup> 8 hours.

TWA: 50 ppm 8 hours.

#### OSHA PEL Z2 (United States, 2/2013).

AMP: 300 ppm 5 minutes.

CEIL: 200 ppm

TWA: 100 ppm 8 hours.

## Section 8. Exposure controls/personal protection

- Appropriate engineering controls** : 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.
- Environmental exposure controls** : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.
- Individual protection measures**
- Hygiene measures** : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.
- Eye/face protection** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.
- Skin protection**
- Hand protection** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
- Body protection** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Other skin protection** : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory protection** : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

## Section 9. Physical and chemical properties

### Appearance

- Physical state** : Liquid. [Watery liquid.]
- Color** : Colorless.
- Molecular weight** : 131.38 g/mole
- Molecular formula** : C<sub>2</sub>H-Cl<sub>3</sub>
- Boiling/condensation point** : 86.7°C (188.1°F)
- Melting/freezing point** : -84.8°C (-120.6°F)
- Critical temperature** : Not available.
- Odor** : Characteristic.
- Odor threshold** : Not available.
- pH** : Not available.
- Flash point** : Not available.
- Burning time** : Not applicable.
- Burning rate** : Not applicable.
- Evaporation rate** : 6.39 (butyl acetate = 1)
- Flammability (solid, gas)** : Not available.

## Section 9. Physical and chemical properties

<b>Lower and upper explosive (flammable) limits</b>	: Lower: 8% Upper: 10.5%
<b>Vapor pressure</b>	: 9.9 kPa (74.256033302 mm Hg) [room temperature]
<b>Vapor density</b>	: 4.5 (Air = 1)
<b>Specific Volume (ft<sup>3</sup>/lb)</b>	: 0.6849
<b>Gas Density (lb/ft<sup>3</sup>)</b>	: 1.46
<b>Relative density</b>	: 1.5
<b>Solubility</b>	: Not available.
<b>Solubility in water</b>	: 1.1 g/l
<b>Partition coefficient: n-octanol/water</b>	: 2.53
<b>Auto-ignition temperature</b>	: 410°C (770°F)
<b>Decomposition temperature</b>	: Not available.
<b>SADT</b>	: Not available.
<b>Viscosity</b>	: Dynamic (room temperature): 0.58 mPa·s (0.58 cP)

## Section 10. Stability and reactivity

<b>Reactivity</b>	: No specific test data related to reactivity available for this product or its ingredients.
<b>Chemical stability</b>	: The product is stable.
<b>Possibility of hazardous reactions</b>	: Under normal conditions of storage and use, hazardous reactions will not occur.
<b>Conditions to avoid</b>	: No specific data.
<b>Incompatible materials</b>	: No specific data.
<b>Hazardous decomposition products</b>	: Under normal conditions of storage and use, hazardous decomposition products should not be produced.
<b>Hazardous polymerization</b>	: 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
trichloroethylene	LC50 Inhalation Vapor	Rat	140700 mg/m <sup>3</sup>	1 hours
	LD50 Dermal	Rabbit	>20 g/kg	-
	LD50 Oral	Rat	4920 mg/kg	-

**IDLH** : 1000 ppm

#### Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
trichloroethylene	Eyes - Moderate irritant	Rabbit	-	24 hours 20 milligrams	-
	Skin - Severe irritant	Rabbit	-	24 hours 2 milligrams	-

#### Sensitization

Not available.

## Section 11. Toxicological information

### Mutagenicity

Not available.

### Carcinogenicity

Not available.

### Classification

Product/ingredient name	OSHA	IARC	NTP
trichloroethylene	-	1	Reasonably anticipated 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)

Not available.

### Aspiration hazard

Not available.

**Information on the likely routes of exposure** : Not available.

### Potential acute health effects

**Eye contact** : Causes serious eye irritation.  
**Inhalation** : No known significant effects or critical hazards.  
**Skin contact** : Causes skin irritation.  
**Ingestion** : No known significant effects or critical hazards.

### 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** : No known significant effects or critical hazards.  
**Carcinogenicity** : May cause cancer. Risk of cancer depends on duration and level of exposure.  
**Mutagenicity** : Suspected of causing genetic defects.

## Section 11. Toxicological information

- Teratogenicity** : No known significant effects or critical hazards.  
**Developmental effects** : No known significant effects or critical hazards.  
**Fertility effects** : No known significant effects or critical hazards.

### Numerical measures of toxicity

#### Acute toxicity estimates

Not available.

## Section 12. Ecological information

### Toxicity

Product/ingredient name	Result	Species	Exposure
trichloroethylene	Acute EC50 95000 µg/l Marine water	Algae - Skeletonema costatum	96 hours
	Acute EC50 36.5 mg/l Fresh water	Algae - Chlamydomonas reinhardtii - Exponential growth phase	72 hours
	Acute LC50 20 mg/l Marine water	Crustaceans - Elminius modestus	48 hours
	Acute LC50 18 mg/l Fresh water	Daphnia - Daphnia magna	48 hours
	Acute LC50 3100 µg/l Fresh water	Fish - Jordanella floridae - Juvenile (Fledgling, Hatchling, Weanling)	96 hours
	Chronic EC10 12.3 mg/l Fresh water	Algae - Chlamydomonas reinhardtii - Exponential growth phase	72 hours
Chronic NOEC 10 mg/l Fresh water	Daphnia - Daphnia magna	21 days	

### Persistence and degradability

Not available.

### Bioaccumulative potential

Product/ingredient name	LogP <sub>ow</sub>	BCF	Potential
trichloroethylene	2.53	17	low

### Mobility in soil

- Soil/water partition coefficient (K<sub>oc</sub>)** : Not available.

- Other adverse effects** : No known significant effects or critical hazards.

## Section 13. Disposal considerations






- Disposal methods** : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

## Section 13. Disposal considerations

### United States - RCRA Toxic hazardous waste "U" List

Ingredient	CAS #	Status	Reference number
Trichloroethylene; Ethene, trichloro-	79-01-6	Listed	U228

## Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
<b>UN number</b>	UN1710	UN1710	UN1710	UN1710	UN1710
<b>UN proper shipping name</b>	TRICHLOROETHYLENE	TRICHLOROETHYLENE	TRICHLOROETHYLENE	TRICHLOROETHYLENE	TRICHLOROETHYLENE
<b>Transport hazard class(es)</b>	6.1 	6.1 	6.1 	6.1 	6.1 
<b>Packing group</b>	III	III	III	III	III
<b>Environment</b>	No.	No.	No.	No.	No.
<b>Additional information</b>	<p><b>Reportable quantity</b> 100 lbs / 45.4 kg [8.2147 gal / 31.096 L] Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.</p> <p><b>Limited quantity</b> Yes.</p> <p><b>Packaging instruction</b> <b>Passenger aircraft</b> Quantity limitation: 60 L</p> <p><b>Cargo aircraft</b> Quantity limitation: 220 L</p> <p><b>Special provisions</b> IB3, N36, T4, TP1, T1</p>	<p>Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.26-2.36 (Class 6).</p> <p><b>Explosive Limit and Limited Quantity Index</b> 5</p>	-	-	<p><b>Passenger and Cargo Aircraft</b> Quantity limitation: 60 L</p> <p><b>Cargo Aircraft Only</b> Quantity limitation: 220 L</p> <p><b>Limited Quantities - Passenger Aircraft</b> Quantity limitation: 2 L</p>

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

**Special precautions for user** : **Transport within user’s premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

**Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code** : Not available.

## Section 15. Regulatory information

- U.S. Federal regulations**
- TSCA 5(a)2 final significant new use rules:** trichloroethylene
  - TSCA 8(a) CDR Exempt/Partial exemption:** Not determined
  - TSCA 12(b) one-time export:** trichloroethylene
  - United States inventory (TSCA 8b):** This material is listed or exempted.
  - Clean Water Act (CWA) 307:** trichloroethylene
  - Clean Water Act (CWA) 311:** trichloroethylene

**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** : Immediate (acute) health hazard  
Delayed (chronic) health hazard

#### Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
trichloroethylene	100	No.	No.	No.	Yes.	Yes.

### SARA 313

	Product name	CAS number	%
<b>Form R - Reporting requirements</b>	trichloroethylene	79-01-6	100
<b>Supplier notification</b>	trichloroethylene	79-01-6	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.



## Section 15. Regulatory information

Ingredient name	Cancer	Reproductive	No significant risk level	Maximum acceptable dosage level
trichloroethylene	Yes.	Yes.	14 µg/day (ingestion) 50 µg/day (inhalation)	No.

### International regulations

#### International lists

#### National inventory

<b>Australia</b>	: This material is listed or exempted.
<b>Canada</b>	: This material is listed or exempted.
<b>China</b>	: This material is listed or exempted.
<b>Europe</b>	: This material is listed or exempted.
<b>Japan</b>	: This material is listed or exempted.
<b>Malaysia</b>	: This material is listed or exempted.
<b>New Zealand</b>	: This material is listed or exempted.
<b>Philippines</b>	: This material is listed or exempted.
<b>Republic of Korea</b>	: This material is listed or exempted.
<b>Taiwan</b>	: This material is listed or exempted.

#### Canada

<b>WHMIS (Canada)</b>	: Class D-1B: Material causing immediate and serious toxic effects (Toxic). Class D-2A: Material causing other toxic effects (Very toxic). Class D-2B: Material causing other toxic effects (Toxic). <b>CEPA Toxic substances:</b> This material is listed. <b>Canadian ARET:</b> This material is not listed. <b>Canadian NPRI:</b> This material is listed. <b>Alberta Designated Substances:</b> This material is not listed. <b>Ontario Designated Substances:</b> This material is not listed. <b>Quebec Designated Substances:</b> This material is not listed.
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## Section 16. Other information

<b>Canada Label requirements</b>	: Class D-1B: Material causing immediate and serious toxic effects (Toxic). Class D-2A: Material causing other toxic effects (Very toxic). Class D-2B: Material causing other toxic effects (Toxic).
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### Hazardous Material Information System (U.S.A.)

Health	*	2
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.)





## Section 16. Other information

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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

### Procedure used to derive the classification

Classification	Justification
Skin Irrit. 2, H315	Expert judgment
Eye Irrit. 2A, H319	Expert judgment
Muta. 2, H341	Expert judgment
Carc. 1, H350	Expert judgment
Aquatic Chronic 3, H412	Expert judgment

### History

**Date of printing** : 11/21/2016  
**Date of issue/Date of revision** : 11/21/2016  
**Date of previous issue** : No previous validation  
**Version** : 0.01

**Key to abbreviations** : ATE = Acute Toxicity Estimate  
 BCF = Bioconcentration Factor  
 GHS = Globally Harmonized System of Classification and Labelling of Chemicals  
 IATA = International Air Transport Association  
 IBC = Intermediate Bulk Container  
 IMDG = International Maritime Dangerous Goods  
 LogPow = logarithm of the octanol/water partition coefficient  
 MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)  
 UN = United Nations

**References** : Not available.

☑ Indicates information that has changed from previously issued version.

### Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 10.24.2014

Page 1 of 8

## Zinc Metal Mossy, Reagent

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

**Product name:** Zinc Metal Mossy, Reagent

**Manufacturer/Supplier Trade name:**

**Manufacturer/Supplier Article number: S25636A**

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

**Manufacturer Details:**

AquaPhoenix Scientific, Inc  
9 Barnhart Drive, Hanover, PA 17331  
(717) 632-1291

**Supplier Details:**

Fisher Science Education  
6771 Silver Crest Road, Nazareth, PA 18064  
(724)517-1954

**Emergency telephone number:**

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

### SECTION 2: Hazards identification

**Classification of the substance or mixture:**



**Corrosive**

Serious eye damage, category 1



**Irritant**

Acute toxicity (oral, dermal, inhalation), category 4



**Environmentally Damaging**

Acute hazards to the aquatic environment, category 1  
Chronic hazards to the aquatic environment, category 1

Eye Damage 1.

Acute Toxicity 4 (oral).

Aquatic Acute Toxicity 1.

Aquatic Chronic Toxicity 1.

**Signal word:** Danger

**Hazard statements:**

Causes serious eye damage.

Harmful if swallowed.

Very toxic to aquatic life.

Very toxic to aquatic life with long lasting effects.

**Precautionary statements:**

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

Keep out of reach of children.

Read label before use.

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

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 10.24.2014

Page 2 of 8

## Zinc Metal Mossy, Reagent

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

Wash skin thoroughly after handling.

Avoid release to the environment.

Rinse mouth.

IF SWALLOWED: Call a POISON CENTER or doctor/physician 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.

Immediately call a POISON CENTER or doctor/physician.

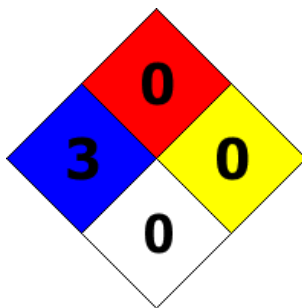
Dispose of contents and container as instructed in Section 13.

### Other Non-GHS Classification:

WHMIS



NFPA/HMIS



NFPA SCALE (0-4)

Health	3
Flammability	0
Physical Hazard	0
Personal Protection	X

HMIS RATINGS (0-4)

### SECTION 3: Composition/information on ingredients

#### Ingredients:

CAS 7446-20-0

Zinc sulfate heptahydrate

100 %

Percentages are by weight

### SECTION 4: First aid measures

#### Description of first aid measures

##### After inhalation:

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

##### After skin contact:

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

##### After eye contact:

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

**Zinc Metal Mossy, Reagent**

**After swallowing:**

Rinse mouth thoroughly. Do not induce vomiting. Seek medical attention if irritation, discomfort, or vomiting persists. Never give anything by mouth to an unconscious person.

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

Irritation- all routes of exposure. Inhalation of fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain and increased white blood cell count. Headache. Nausea. Shortness of breath. May cause bronchitis.

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

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

**SECTION 5: Firefighting measures**

**Extinguishing media**

**Suitable extinguishing agents:**

Use agent most suitable for extinguishing surrounding fire. Use water spray to keep fire-exposed containers cool.

**Unsuitable extinguishing agents:**

None identified.

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

Thermal decomposition can lead to release of irritating gases and vapors. Containers may explode in the heat of a fire.

**Advice for firefighters:**

**Protective equipment:**

Wear protective eyewear, gloves, and clothing. Refer to Section 8. Use NIOSH-approved respiratory protection/breathing apparatus.

**Additional information (precautions):**

Avoid inhaling gases, fumes, dust, mist, vapor, and aerosols. Avoid contact with skin, eyes, and clothing.

**SECTION 6: Accidental release measures**

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

Ensure adequate ventilation. Ensure that air-handling systems are operational.

**Environmental precautions:**

Should not be released into environment. Prevent from reaching drains, sewer, or waterway.

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

Wear protective eyewear, gloves, and clothing. Refer to Section 8. Always obey local regulations. Containerize for disposal. Refer to Section 13. Sweep up and containerize for disposal. Avoid generating dust. If necessary use trained response staff or contractor. Evacuate personnel to safe areas. Keep in suitable closed containers for disposal.

**Reference to other sections:** None

**SECTION 7: Handling and storage**

**Precautions for safe handling:**

Avoid contact with skin, eyes, and clothing. Follow good hygiene procedures when handling chemical materials. Refer to Section 8. Follow proper disposal methods. Refer to Section 13. Do not eat, drink, smoke, or use personal products when handling chemical substances.

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

Store in a cool location. Keep away from food and beverages. Protect from freezing and physical damage.

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 10.24.2014

Page 4 of 8

## Zinc Metal Mossy, Reagent

Provide ventilation for containers. Keep container tightly sealed. Store away from incompatible materials.

### SECTION 8: Exposure controls/personal protection



**Control Parameters:**

7446-20-0, Zinc, ACGIH TLV: NA, OSHA PEL: NA.

**Appropriate Engineering controls:**

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

**Respiratory protection:**

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

**Protection of skin:**

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

**Eye protection:**

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

**General hygienic measures:**

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

### SECTION 9: Physical and chemical properties

<b>Appearance (physical state, color):</b>	Gray solid	<b>Explosion limit lower:</b> <b>Explosion limit upper:</b>	Not determined Not determined
<b>Odor:</b>	Odorless	<b>Vapor pressure at 20°C:</b>	1 mmHg @ 487C
<b>Odor threshold:</b>	Not determined	<b>Vapor density:</b>	Not determined
<b>pH-value:</b>	Not determined	<b>Relative density:</b>	Not determined
<b>Melting/Freezing point:</b>	419C	<b>Solubilities:</b>	Reacts with water.
<b>Boiling point/Boiling range:</b>	908C	<b>Partition coefficient (n-octanol/water):</b>	Not determined
<b>Flash point (closed cup):</b>	Not determined	<b>Auto/Self-ignition temperature:</b>	460C
<b>Evaporation rate:</b>	Not determined	<b>Decomposition temperature:</b>	Not determined
<b>Flammability (solid, gaseous):</b>	Not determined	<b>Viscosity:</b>	a. Kinematic: Not determined b. Dynamic: Not determined
<b>Density at 20°C:</b>	7.14 g/cm <sup>3</sup> at 20 °C <b>Specific Gravity:</b> :7.14		

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 10.24.2014

Page 5 of 8

## Zinc Metal Mossy, Reagent

### SECTION 10: Stability and reactivity

#### Reactivity:

Nonreactive under normal conditions. Reacts with water.

#### Chemical stability:

Stable under normal conditions.

#### Possible hazardous reactions:

None under normal processing.

#### Conditions to avoid:

Incompatible materials. Excess heat.

#### Incompatible materials:

Oxidizing agents. Strong acids or bases.

#### Hazardous decomposition products:

Zinc oxides.

### SECTION 11: Toxicological information

**Acute Toxicity:** No additional information.

**Chronic Toxicity:** No additional information.

**Corrosion Irritation:** No additional information.

**Sensitization:** No additional information.

**Numerical Measures:** No additional information.

#### Carcinogenicity:

EPA: IRIS Carcinogenicity Assessment- D (data are inadequate for an assessment of human carcinogenic potential; inadequate information to assess carcinogenic potential) Zinc

**Mutagenicity:** No additional information.

#### Reproductive Toxicity:

Reproductive effects shown in laboratory animals.

### SECTION 12: Ecological information

#### Ecotoxicity:

Fish (acute 7440-66-6): : 96 Hr LC50 Pimephales promelas: 2.16 - 3.05 mg/L [flow-through]; 96 Hr LC50 Pimephales promelas: 0.211 - 0.269 mg/L [semi-static]; 96 Hr LC50 Pimephales promelas: 2.66 mg/L [static]; 96 Hr LC50 Cyprinus carpio: 30 mg/L; 96 Hr LC50 Cyprinus carpio: 0.45 mg/L [semi-static]; 96 Hr LC50 Cyprinus carpio: 7.8 mg/L [static]; 96 Hr LC50 Lepomis macrochirus: 3.5 mg/L [static]; 96 Hr LC50 Oncorhynchus mykiss: 0.24 mg/L [flow-through]; 96 Hr LC50 Oncorhynchus mykiss: 0.59 mg/L [semi-static]; 96 Hr LC50 Oncorhynchus mykiss: 0.41 mg/L [static]

Crustacea (acute 7440-66-6): : 48 Hr EC50 Daphnia magna: 0.139 - 0.908 mg/L [Static]

Algae (acute 7440-66-6): 96 Hr EC50 Pseudokirchneriella subcapitata: 0.11 - 0.271 mg/L [static]; 72 Hr EC50 Pseudokirchneriella subcapitata: 0.09 - 0.125 mg/L [static]

**Persistence and degradability:** No additional information.

**Bioaccumulative potential:** No additional information.

**Mobility in soil:** No additional information.

**Other adverse effects:** No additional information.

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 10.24.2014

Page 6 of 8

## Zinc Metal Mossy, Reagent

### SECTION 13: Disposal considerations

#### Waste disposal recommendations:

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

### SECTION 14: Transport information

#### US DOT

##### UN Number:

ADR, ADN, DOT, IMDG, IATA

Not Regulated.

##### Limited Quantity Exception:

None

##### Bulk:

**RQ (if applicable):** None

**Proper shipping Name:** Not Regulated.

**Hazard Class:** None

**Packing Group:** Not Regulated.

**Marine Pollutant (if applicable):** No additional information.

**Comments:** None

##### Non Bulk:

**RQ (if applicable):** None

**Proper shipping Name:** Not Regulated.

**Hazard Class:** None

**Packing Group:** Not Regulated.

**Marine Pollutant (if applicable):** No additional information.

**Comments:** None

### SECTION 15: Regulatory information

#### United States (USA)

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

None of the ingredients are listed.

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

7440-66-6 Zinc Compounds (N982).

##### RCRA (hazardous waste code):

7440-66-6 Zinc [Phase 4 LDR Rule - Universal Treatment Standards 2.61 mg/L (wastewater); 4.3 mg/L TCLP (nonwastewater)].

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

All ingredients are listed.

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

7440-66-6 Zinc 1000 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  $\geq 100 \mu\text{m}$ ).

#### Proposition 65 (California):

## Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 10.24.2014

Page 7 of 8

### Zinc Metal Mossy, Reagent

**Chemicals known to cause cancer:**

None of the ingredients are listed.

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

None of the ingredients are listed.

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

None of the ingredients are listed.

**Chemicals known to cause developmental toxicity:**

None of the ingredients are listed.

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

All ingredients are listed.

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

None of the ingredients are listed.

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

None of the ingredients are listed.

**SECTION 16: Other information**

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

**GHS Full Text Phrases:** None

**Abbreviations and Acronyms:**

IMDG International Maritime Code for Dangerous Goods.  
IATA International Air Transport Association.  
GHS Globally Harmonized System of Classification and Labelling of Chemicals.  
ACGIH American Conference of Governmental Industrial Hygienists.  
CAS Chemical Abstracts Service (division of the American Chemical Society).  
NFPA National Fire Protection Association (USA).  
HMIS Hazardous Materials Identification System (USA).  
WHMIS Workplace Hazardous Materials Information System (Canada).  
DNEL Derived No-Effect Level (REACH).  
PNEC Predicted No-Effect Concentration (REACH).  
CFR Code of Federal Regulations (USA).  
SARA Superfund Amendments and Reauthorization Act (USA).  
RCRA Resource Conservation and Recovery Act (USA).  
TSCA Toxic Substances Control Act (USA).  
NPRI National Pollutant Release Inventory (Canada).  
DOT US Department of Transportation.



# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

**Effective date :** 10.24.2014

Page 8 of 8

## Zinc Metal Mossy, Reagent

**Effective date:** 10.24.2014

**Last updated:** 06.19.2015

# SAFETY DATA SHEET

Version 6.2  
Revision Date 10/02/2020  
Print Date 08/23/2021

## SECTION 1: Identification of the substance/mixture and of the company/undertaking

### 1.1 Product identifiers

Product name : 2-Methylphenol  
Product Number : 442361  
Brand : Supelco  
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, 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 3), H301  
Acute toxicity, Dermal (Category 3), H311  
Skin corrosion (Category 1B), H314  
Serious eye damage (Category 1), H318  
Short-term (acute) aquatic hazard (Category 2), H401  
Long-term (chronic) aquatic hazard (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 dusts or mists.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/ doctor. Rinse mouth.
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.
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

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Synonyms	:	o-Cresol 2-Methylphenol
Formula	:	C7H8O
Molecular weight	:	108.14 g/mol
CAS-No.	:	95-48-7
EC-No.	:	202-423-8
Index-No.	:	604-004-00-9

Component	Classification	Concentration
<b>o-cresol</b>		
	Acute Tox. 3; Skin Corr. 1B; Eye Dam. 1; Aquatic Acute 2; Aquatic Chronic 2; H301, H311, H314, H318, H401, H411	<= 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

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

---

## 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

### 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

Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs. Avoid contact with skin and eyes. Avoid formation of dust and aerosols.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

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

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

Store at room temperature. Air and light sensitive. Keep in a dry place.

Storage class (TRGS 510): 6.1B: 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

---

## SECTION 8: Exposure controls/personal protection

### 8.1 Control parameters

#### Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
o-cresol	95-48-7	TWA	2.3 ppm 10 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
		TWA	5 ppm 22 mg/m <sup>3</sup>	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	Skin designation The value in mg/m <sup>3</sup> is approximate.		
		TWA	20 mg/m <sup>3</sup>	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Not classifiable as a human carcinogen Danger of cutaneous absorption		

		PEL	5 ppm 22 mg/m <sup>3</sup>	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

## 8.2 Exposure controls

### Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

### Personal protective equipment

#### Eye/face protection

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

#### Skin protection

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

#### Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.4 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 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

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: powder Color: white
b) Odor	No data available
c) Odor 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) Vapor pressure	3.1 hPa at 60.0 °C (140.0 °F) 1.3 hPa at 38.2 °C(100.8 °F) 0.4 hPa at 20.0 °C(68.0 °F)
l) Vapor density	No data available
m) Relative density	1.05 g/cm <sup>3</sup> 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) Autoignition temperature	599.0 °C (1110.2 °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

---

## 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

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

---

## SECTION 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/m<sup>3</sup>

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 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

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, Diarrhea, Gastrointestinal disturbance

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

---

**SECTION 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

---

**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: 3455 Class: 6.1 (8) Packing group: II  
Proper shipping name: Cresols, solid  
Reportable Quantity (RQ): 100 lbs  
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

---

**SECTION 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	2007-03-01

**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	2007-03-01

**SARA 311/312 Hazards**

Acute Health Hazard, Chronic Health Hazard

Reportable Quantity : D023 lbs

## Massachusetts Right To Know Components

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

## Pennsylvania Right To Know Components

o-cresol

CAS-No.  
95-48-7

Revision Date  
2007-03-01

---

### SECTION 16: Other information

#### Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](http://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: 6.2

Revision Date: 10/02/2020

Print Date: 08/23/2021

## SAFETY DATA SHEET

Version 8.4  
Revision Date 02/25/2021  
Print Date 08/21/2021

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : 3-Methylphenol  
Product Number : 442391  
Brand : Supelco  
Index-No. : 604-004-00-9  
CAS-No. : 108-39-4

**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)**

Flammable liquids (Category 4), H227  
Acute toxicity, Oral (Category 3), H301  
Acute toxicity, Dermal (Category 3), H311  
Skin corrosion (Category 1B), H314  
Serious eye damage (Category 1), H318  
Short-term (acute) aquatic hazard (Category 2), H401  
Long-term (chronic) aquatic hazard (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)	
H227	Combustible liquid.
H301 + H311	Toxic if swallowed or in contact with skin.
H314	Causes severe skin burns and eye damage.
H401	Toxic to aquatic life.
H412	Harmful to aquatic life with long lasting effects.
Precautionary statement(s)	
P210	Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/ doctor. Rinse mouth.
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.
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

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Synonyms	:	m-Cresol 3-Methylphenol
Formula	:	C <sub>7</sub> H <sub>8</sub> O
Molecular weight	:	108.14 g/mol
CAS-No.	:	108-39-4
EC-No.	:	203-577-9
Index-No.	:	604-004-00-9

Component	Classification	Concentration
<b>meta-Cresol</b>		
	Flam. Liq. 4; Acute Tox. 3; Skin Corr. 1B; Eye Dam.	<= 100 %

	1; Aquatic Acute 2; Aquatic Chronic 3; H227, H301, H311, H314, H318, H401, H412	
--	------------------------------------------------------------------------------------------	--

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

If swallowed: give water to drink (two glasses at most). Seek medical advice immediately. In exceptional cases only, if medical care is not available within one hour, induce vomiting (only in persons who are wide awake and fully conscious), administer activated charcoal (20 - 40 g in a 10% slurry) and consult a doctor as quickly as possible. 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 (CO<sub>2</sub>) 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

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

Remove container from danger zone and cool with water. 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. Keep away from heat and sources of ignition. 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

#### Advice on protection against fire and explosion

Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharge.

#### 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. Keep in a well-ventilated place. Keep locked up or in an area accessible only to qualified or authorized persons.

Storage class (TRGS 510): 6.1A: 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

## SECTION 8: Exposure controls/personal protection

### 8.1 Control parameters

#### Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
meta-Cresol	108-39-4	TWA	2.3 ppm 10 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
		TWA	5 ppm 22 mg/m <sup>3</sup>	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	Skin designation		
		TWA	20 mg/m <sup>3</sup>	USA. ACGIH Threshold Limit Values (TLV)
		Not classifiable as a human carcinogen Danger of cutaneous absorption		
		PEL	5 ppm 22 mg/m <sup>3</sup>	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

### 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

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](http://www.kcl.de)).

Full contact

Material: Chloroprene

Minimum layer thickness: 0.65 mm

Break through time: 480 min

Material tested:KCL 720 Camapren®

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](http://www.kcl.de)).

Splash contact

Material: Latex gloves

Minimum layer thickness: 0.6 mm

Break through time: 60 min



Material tested:Lapren® (KCL 706 / Aldrich Z677558, Size M)

### **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<br>Color: colorless, light yellow                       |
| b) Odor                                         | phenol-like                                                          |
| c) Odor Threshold                               | No data available                                                    |
| d) pH                                           | No data available                                                    |
| e) Melting point/freezing point                 | Melting point/range: 8 - 10 °C (46 - 50 °F) - lit.                   |
| f) Initial boiling point and boiling range      | 203 °C 397 °F - lit.                                                 |
| g) Flash point                                  | 86 °C (187 °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: 1.35 %(V)<br>Lower explosion limit: 1.06 %(V) |
| k) Vapor pressure                               | < 1 hPa at 20 °C (68 °F)                                             |
| l) Vapor density                                | 3.73 - (Air = 1.0)                                                   |
| m) Relative density                             | 1.03 at 20 °C (68 °F)                                                |
| n) Water solubility                             | 22.7 g/l at 25 °C (77 °F)                                            |
| o) Partition coefficient: n-octanol/water       | log Pow: 1.96 - Bioaccumulation is not expected.                     |
| p) Autoignition temperature                     | 559 °C (1038 °F) at 1,013 hPa                                        |
| 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

Dissociation constant 10.09 at 25 °C (77 °F)  
Relative vapor density 3.73 - (Air = 1.0)

---

## 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.

### 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  
Nitric acid  
fuming sulfuric acid  
chlorosulfonic acid  
alkalines

### 10.4 Conditions to avoid

Strong heating.

### 10.5 Incompatible materials

bronze, brass, Iron, Lead

### 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

LD50 Oral - Rat - male - 242 mg/kg  
(OECD Test Guideline 401)

Symptoms: If ingested, severe burns of the mouth and throat, as well as a danger of perforation of the esophagus and the stomach.

Inhalation: No data available

Symptoms: mucosal irritations, Cough, Shortness of breath, Possible damages: , damage of respiratory tract

Inhalation: Corrosive to respiratory system.

LD50 Dermal - Rabbit - 620 mg/kg

Remarks:

Behavioral:Somnolence (general depressed activity).

Behavioral:Tetany.

(RTECS)

No data available

**Skin corrosion/irritation**

Skin - Rabbit

Result: Causes burns. - 24 h

Remarks:

(ECHA)

Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

**Serious eye damage/eye irritation**

Causes serious eye damage.

**Respiratory or skin sensitization**

No data available

**Germ cell mutagenicity**

Ames test

Escherichia coli/Salmonella typhimurium

Result: negative

Mutagenicity (mammal cell test): chromosome aberration.

Chinese hamster lung cells

Result: positive

In vitro mammalian cell gene mutation test

mouse lymphoma cells

Result: negative

OECD Test Guideline 475

Mouse - male and female - Bone marrow

Result: negative

**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

Acute oral toxicity - If ingested, severe burns of the mouth and throat, as well as a danger of perforation of the esophagus and the stomach.

Acute inhalation toxicity - mucosal irritations, Cough, Shortness of breath, Possible damages:, damage of respiratory tract

**Specific target organ toxicity - repeated exposure**

No data available

**Aspiration hazard**

No data available

**11.2 Additional Information**

Repeated dose toxicity - Rat - male - Oral - 13 Weeks - NOAEL (No observed adverse effect level) - 50 mg/kg

RTECS: GO6125000

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., Cough, Shortness of breath, Headache, Nausea  
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

After absorption:

Systemic effects:

Headache  
Nausea  
Vomiting  
Dizziness  
agitation, spasms  
respiratory arrest  
Unconsciousness

Damage to:

Central nervous system  
Liver  
Kidney

This substance should be handled with particular care.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

---

## SECTION 12: Ecological information

### 12.1 Toxicity

Toxicity to fish	static test LC50 - <i>Salvelinus fontinalis</i> - 7.6 mg/l - 96 h Remarks: (ECHA)
	static test LC50 - <i>Oncorhynchus mykiss</i> (rainbow trout) - 8.6 mg/l - 96 h Remarks: (ECHA)
	static test LC50 - <i>Salmo trutta</i> (brown trout) - 8.4 mg/l - 96 h Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates	flow-through test EC50 - <i>Daphnia pulex</i> - > 99.5 mg/l - 48 h (US-EPA)

### 12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 10 d Result: 96 % - Inherently biodegradable. (OECD Test Guideline 302B)
------------------	--------------------------------------------------------------------------------------------------------

### 12.3 Bioaccumulative potential

Bioaccumulation Leuciscus idus (Golden orfe) - 3 d  
- 0.05 mg/l(meta-Cresol)

Bioconcentration factor (BCF): 17 - 20

### 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

Biological effects:

Hazard for drinking water supplies.

Change in the flavour characteristics of fish protein.

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](http://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: 2076 Class: 6.1 (8) Packing group: II

Proper shipping name: Cresols, liquid

Reportable Quantity (RQ): 100 lbs

Reportable Quantity (RQ): 100 lbs

Poison Inhalation Hazard: No

#### IMDG

UN number: 2076 Class: 6.1 (8) Packing group: II EMS-No: F-A, S-B

Proper shipping name: CRESOLS, LIQUID

#### IATA

UN number: 2076 Class: 6.1 (8) Packing group: II

Proper shipping name: Cresols, liquid

---

## SECTION 15: Regulatory information

#### SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

#### SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

meta-Cresol	CAS-No. 108-39-4	Revision Date 2007-03-01
-------------	---------------------	-----------------------------

**SARA 311/312 Hazards**

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

**Reportable Quantity** : D024 lbs

**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](http://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: 8.4

Revision Date: 02/25/2021

Print Date: 08/21/2021

## SAFETY DATA SHEET

Version 6.2  
Revision Date 09/30/2020  
Print Date 08/21/2021

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : 4-Methylphenol  
Product Number : 442418  
Brand : Supelco  
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 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 3), H301  
Acute toxicity, Dermal (Category 3), H311  
Skin corrosion (Category 1B), H314  
Serious eye damage (Category 1), H318  
Short-term (acute) aquatic hazard (Category 2), H401  
Long-term (chronic) aquatic hazard (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 dusts or mists.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/ doctor. Rinse mouth.
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/ doctor.
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

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Synonyms	:	p-Cresol 4-Methylphenol
Formula	:	C <sub>7</sub> H <sub>8</sub> O
Molecular weight	:	108.14 g/mol
CAS-No.	:	106-44-5
EC-No.	:	203-398-6
Index-No.	:	604-004-00-9

Component	Classification	Concentration
<b>p-cresol</b>	Acute Tox. 3; Skin Corr. 1B; Eye Dam. 1; Aquatic Acute 2; H301, H311, H314, H318, H401	<= 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**

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

---

## **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  
Combustible.

### **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. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

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

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

Store at room temperature. hygroscopic Air and light sensitive. Handle and store under inert gas.

Storage class (TRGS 510): 6.1B: 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

---

## SECTION 8: Exposure controls/personal protection

### 8.1 Control parameters

#### Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
p-cresol	106-44-5	TWA	2.3 ppm 10 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
		TWA	5 ppm 22 mg/m <sup>3</sup>	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	Skin designation		
		TWA	20 mg/m <sup>3</sup>	USA. ACGIH Threshold Limit Values (TLV)
		Not classifiable as a human carcinogen Danger of cutaneous absorption		
		PEL	5 ppm 22 mg/m <sup>3</sup>	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

## 8.2 Exposure controls

### Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

### Personal protective equipment

#### Eye/face protection

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

#### Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.4 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 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

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: colorless
b) Odor	No data available
c) Odor Threshold	No data available
d) pH	No data available
e) Melting point/freezing 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) Vapor pressure	1.3 hPa at 20.0 °C (68.0 °F)
l) Vapor density	No data available
m) Relative density	1.034 g/mL at 25 °C (77 °F)
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	log Pow: 1.94
p) Autoignition temperature	559.0 °C (1038.2 °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

---

## 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

Oxidizing agents, Bases

### 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

---

## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

#### Acute toxicity

LD50 Oral - Rat - male - 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. (ECHA)

LC50 Inhalation - Rat - 1 h - > 710 mg/m<sup>3</sup>

Remarks: (RTECS)

LD50 Dermal - Rabbit - 301.0 mg/kg

Remarks: Behavioral:Tremor. Gastrointestinal:Changes in structure or function of salivary glands. Kidney, Ureter, Bladder:Other changes. (ECHA)

No data available

#### Skin corrosion/irritation

Skin - Rabbit

Result: Causes burns.

Remarks: (ECHA)

#### Serious eye damage/eye irritation

Causes serious eye damage.

#### Respiratory or skin sensitization

Draize Test - Guinea pig

Result: negative

(OECD Test Guideline 406)

#### Germ cell mutagenicity

Ames test

Salmonella typhimurium

Result: negative

In vitro mammalian cell gene mutation test

mouse lymphoma cells

Result: negative

Mutagenicity (mammal cell test): chromosome aberration.

Chinese hamster ovary cells

Result: positive

OECD Test Guideline 478

Mouse - male

Result: negative

#### 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

Acute oral toxicity - If ingested, severe burns of the mouth and throat, as well as a danger of perforation of the esophagus and the stomach.

**Specific target organ toxicity - repeated exposure**

No data available

**Aspiration hazard**

No data available

**Additional Information**

Repeated dose toxicity - Rat - male and female - Oral - 13 Weeks - NOAEL (No observed adverse effect level) - 50 mg/kg

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.

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

Kidney -

**SECTION 12: Ecological information**

**12.1 Toxicity**

Toxicity to fish	static test LC50 - Salmo trutta (brown trout) - 4.4 mg/l - 96 h Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 7.7 mg/l - 48 h (DIN 38412)
Toxicity to algae	static test ErC50 - Desmodesmus subspicatus (green algae) - 21 mg/l - 48 h (DIN 38412)
Toxicity to bacteria	static test EC50 - Tetrahymena pyriformis - 157 mg/l - 48 h Remarks: (ECHA)

**12.2 Persistence and degradability**

Biodegradability aerobic - Exposure time 10 d

Result: 100 % - Inherently biodegradable.  
(OECD Test Guideline 302B)

### 12.3 Bioaccumulative potential

Bioaccumulation Danio rerio (zebra fish)(p-cresol)

Bioconcentration factor (BCF): 10.7  
(OECD Test Guideline 305)

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

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

Toxic to aquatic life.

Biological effects:

Change in the flavour characteristics of fish protein.

Hazard for drinking water supplies.

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. 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: 3455 Class: 6.1 (8) Packing group: II  
Proper shipping name: Cresols, solid  
Reportable Quantity (RQ): 100 lbs  
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

---

## 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

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

**Reportable Quantity** : D025 lbs

### 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 the State of California to cause cancer, birth, or any other reproductive defects.

---

## SECTION 16: Other information

### Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](http://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: 6.2

Revision Date: 09/30/2020

Print Date: 08/21/2021

### 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : 1,3,5-Trimethylbenzene solution

Product Number : 41103  
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

Flammable liquid, Target Organ Effect, Toxic by inhalation., Toxic by ingestion, Toxic by skin absorption

##### Target Organs

Eyes, Kidney, Liver, Heart, Central nervous system

##### GHS Classification

Flammable liquids (Category 2)  
Acute toxicity, Oral (Category 3)  
Acute toxicity, Inhalation (Category 3)  
Acute toxicity, Dermal (Category 3)  
Skin irritation (Category 2)  
Eye irritation (Category 2A)  
Specific target organ toxicity - single exposure (Category 1)

##### GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H225 Highly flammable liquid and vapour.  
H301 + H311 Toxic if swallowed or in contact with skin  
H315 Causes skin irritation.  
H319 Causes serious eye irritation.  
H331 Toxic if inhaled.  
H370 Causes damage to organs.

Precautionary statement(s)

P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.  
P260 Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.  
P280 Wear protective gloves/ protective clothing.

P301 + P310 IF SWALLOWED: 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.  
 P307 + P311 IF exposed: Call a POISON CENTER or doctor/ physician.

**HMIS Classification**

**Health hazard:** 2  
**Chronic Health Hazard:** \*  
**Flammability:** 3  
**Physical hazards:** 0

**NFPA Rating**

**Health hazard:** 2  
**Fire:** 3  
**Reactivity Hazard:** 0

**Potential Health Effects**

**Inhalation** Toxic if inhaled. Causes respiratory tract irritation.  
**Skin** Toxic if absorbed through skin. Causes skin irritation.  
**Eyes** Causes eye irritation.  
**Ingestion** Toxic if swallowed.

---

**3. COMPOSITION/INFORMATION ON INGREDIENTS**

Synonyms : Mesitylenesolution

Component	Classification	Concentration
<b>Methanol</b>		
CAS-No. 67-56-1	Flam. Liq. 2; Acute Tox. 3; STOT SE 1; H225, H301 + H311 + H331, H370	90 - 100 %
EC-No. 200-659-6		
Index-No. 603-001-00-X		
Registration number 01-2119433307-44-XXXX		

For the full text of the H-Statements and R-Phrases mentioned in this Section, see Section 16

---

**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. 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.

---

**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**

Wear respiratory protection. 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.

**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.

Use explosion-proof equipment. 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.

Recommended storage temperature: 2 - 8 °C

**8. EXPOSURE CONTROLS/PERSONAL PROTECTION****Components with workplace control parameters**

Components	CAS-No.	Value	Control parameters	Basis
Methanol	67-56-1	TWA	200 ppm	USA. ACGIH Threshold Limit Values (TLV)
Remarks	Headache Eye damage Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Danger of cutaneous absorption			
		STEL	250 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Headache Eye damage Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Danger of cutaneous absorption			
		TWA	200 ppm 260 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
	Skin notation			
		STEL	250 ppm 325 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
	Skin notation			
		TWA	200 ppm 260 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	The value in mg/m3 is approximate.			
		TWA	200 ppm 260 mg/m3	USA. NIOSH Recommended Exposure Limits

	Potential for dermal absorption		
	ST	250 ppm 325 mg/m3	USA. NIOSH Recommended Exposure Limits
	Potential for dermal absorption		

### 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 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).

#### Hand protection

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

#### Eye protection

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

#### Skin and body protection

Complete suit protecting against chemicals, 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

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### Appearance

Form	liquid
Colour	colourless

### Safety data

pH	no data available
Melting point/freezing point	Melting point/range: -98 °C (-144 °F)
Boiling point	64 - 65 °C (147 - 149 °F) at 1,013 hPa (760 mmHg)
Flash point	11 °C (52 °F) - closed cup
Ignition temperature	no data available
Auto-ignition temperature	385 °C (725 °F)
Lower explosion limit	6 %(V)
Upper explosion limit	36 %(V)
Vapour pressure	130.23 hPa (97.68 mmHg) at 20 °C (68 °F) 547 hPa (410 mmHg) at 50 °C (122 °F)
Density	0.791 g/cm3
Water solubility	completely miscible
Partition coefficient: n-octanol/water	no data available
Relative vapor 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. Extremes of temperature and direct sunlight.

### Materials to avoid

Acids, Oxidizing agents, Alkali metals, Strong oxidizing agents, Acid chlorides, Acid anhydrides, Reducing 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

Dermal LD50

Other information on acute toxicity

no data available

### Skin corrosion/irritation

no data available

### Serious eye damage/eye irritation

Eyes: no data available

### Respiratory or skin sensitization

no data available

### Germ cell mutagenicity

no data available

### Carcinogenicity

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

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

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

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

### Reproductive toxicity

no data available

### Teratogenicity

no data available

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

no data available

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

no data available

**Aspiration hazard**

no data available

**Potential health effects**

<b>Inhalation</b>	Toxic if inhaled. Causes respiratory tract irritation.
<b>Ingestion</b>	Toxic if swallowed.
<b>Skin</b>	Toxic if absorbed through skin. Causes skin irritation.
<b>Eyes</b>	Causes eye irritation.

**Signs and Symptoms of Exposure**

Methyl alcohol may be fatal or cause blindness if swallowed., Cannot be made non-poisonous., Effects due to ingestion may include:, Nausea, Dizziness, Gastrointestinal disturbance, Weakness, Confusion., Drowsiness, Unconsciousness, May cause convulsions.

**Synergistic effects**

no data available

**Additional Information**

RTECS: Not available

---

**12. ECOLOGICAL INFORMATION**

**Toxicity**

no data available

**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**

no data available

---

**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: 1230 Class: 3 Packing group: II  
Proper shipping name: Methanol, solution  
Marine Pollutant: No  
Poison Inhalation Hazard: No

**IMDG**

UN number: 1230 Class: 3 (6.1) Packing group: II EMS-No: F-E, S-D  
Proper shipping name: METHANOL, SOLUTION  
Marine Pollutant: No

**IATA**

UN number: 1230 Class: 3 (6.1) Packing group: II  
Proper shipping name: Methanol, solution

---

**15. REGULATORY INFORMATION**

**OSHA Hazards**

Flammable liquid, Target Organ Effect, Toxic by inhalation., Toxic by ingestion, Toxic by skin absorption

**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
Methanol	67-56-1	2007-07-01

**SARA 311/312 Hazards**

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

**Massachusetts Right To Know Components**

	CAS-No.	Revision Date
Methanol	67-56-1	2007-07-01

**Pennsylvania Right To Know Components**

	CAS-No.	Revision Date
Methanol	67-56-1	2007-07-01

**New Jersey Right To Know Components**

	CAS-No.	Revision Date
Methanol	67-56-1	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**

**Text of H-code(s) and R-phrased(s) mentioned in Section 3**

Acute Tox.	Acute toxicity
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H301 + H311 + H331	Toxic if swallowed, in contact with skin or if inhaled
H370	Causes damage to organs.
STOT SE	Specific target organ toxicity - single exposure

**Further information**

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## SAFETY DATA SHEET

Version 6.3  
Revision Date 10/11/2020  
Print Date 08/21/2021**SECTION 1: Identification of the substance/mixture and of the company/undertaking****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, 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 STATESTelephone : +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)**

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

---

### SECTION 3: Composition/information on ingredients

#### 3.1 Substances

Synonyms : Durene  
1,2,4,5-Tetramethylbenzene

Formula : C<sub>10</sub>H<sub>14</sub>  
Molecular weight : 134.22 g/mol  
CAS-No. : 95-93-2  
EC-No. : 202-465-7

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. 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

---

## 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

### 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.

---

## 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. 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.

---

## SECTION 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.

Storage class (TRGS 510): 4.1B: Flammable solid hazardous materials

### 7.3 Specific end use(s)

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

---

## 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.

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

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.

---

## SECTION 9: Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

a) Appearance	Form: crystalline Color: colorless
b) Odor	No data available
c) Odor 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) Evaporation rate	No data available
i) Flammability (solid, gas)	The substance or mixture is a flammable solid with the category 1.
j) Upper/lower flammability or explosive limits	No data available
k) Vapor pressure	No data available
l) Vapor 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) 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

Heat, flames and sparks. Extremes of temperature and direct sunlight.

## 10.5 Incompatible materials

Strong oxidizing agents

## 10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

---

## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

#### Acute toxicity

LD50 Oral - Rat - 6,700 mg/kg

Remarks: (RTECS)

#### Skin corrosion/irritation

#### Serious eye damage/eye irritation

#### Respiratory or skin sensitization

#### Germ cell mutagenicity

#### 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.

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

#### Specific target organ toxicity - single exposure

#### Specific target organ toxicity - repeated exposure

#### Aspiration hazard

#### Additional Information

RTECS: DC0500000

The data available to us do not suffice to permit any industrial-toxicological assessment.

Further toxicological data:

Risk of absorption.

Other dangerous properties can not be excluded.

Further data:

Handle in accordance with good industrial hygiene and safety practice.

---

## SECTION 12: Ecological information

### 12.1 Toxicity

Toxicity to fish	LC0 - Leuciscus idus (Golden orfe) - 10 mg/l - 48 h Remarks: (ECOTOX Database)
	LC50 - Leuciscus idus (Golden orfe) - 30 mg/l - 48 h Remarks: (ECOTOX Database)
	LC100 - Leuciscus idus (Golden orfe) - 50 mg/l - 48 h Remarks: (ECOTOX Database)
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 0.47 mg/l - 48 h Remarks: (External MSDS)

### 12.2 Persistence and degradability

Not readily biodegradable.

### 12.3 Bioaccumulative potential

### 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

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.

---

## SECTION 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):  
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)

**IATA**

UN number: 1325 Class: 4.1 Packing group: II  
Proper shipping name: Flammable solid, organic, n.o.s. (1,2,4,5-tetramethylbenzene)

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**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**

Fire Hazard

**Massachusetts Right To Know Components**

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

**Pennsylvania Right To Know Components**

1,2,4,5-tetramethylbenzene	CAS-No. 95-93-2	Revision Date
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**New Jersey Right To Know Components**

1,2,4,5-tetramethylbenzene	CAS-No. 95-93-2	Revision Date
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**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.

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**SECTION 16: Other information****Further information**

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](http://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: 6.3

Revision Date: 10/11/2020

Print Date: 08/21/2021

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 12.21.2014

Page 1 of 7

## Barium Chloride Dihydrate

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

**Product name :** Barium Chloride Dihydrate

**Manufacturer/Supplier Trade name:**

**Manufacturer/Supplier Article number: S25187A**

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

**Manufacturer Details:**

AquaPhoenix Scientific  
9 Barnhart Drive, Hanover, PA 17331

**Supplier Details:**

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

**Emergency telephone number:**

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

### SECTION 2 : Hazards identification

**Classification of the substance or mixture:**



**Toxic**

Acute toxicity (oral, dermal, inhalation), category 3



**Irritant**

Acute toxicity (oral, dermal, inhalation), category 4

AcTox Oral 3

AcTox Inhaln. 4

**Signal word :** Danger

**Hazard statements:**

Toxic if swallowed

Harmful if inhaled

**Precautionary statements:**

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

Keep out of reach of children

Read label before use

Do not eat, drink or smoke when using this product

Use only outdoors or in a well-ventilated area

Avoid breathing dust/fume/gas/mist/vapours/spray

Wash skin thoroughly after handling

IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician

Rinse mouth

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

Specific treatment (see supplemental first aid instructions on this label)

Call a POISON CENTER or doctor/physician if you feel unwell

Store locked up

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 12.21.2014

Page 2 of 7

## Barium Chloride Dihydrate

Dispose of contents and container as instructed in Section 13

### Other Non-GHS Classification:

WHMIS



NFPA/HMIS



NFPA SCALE (0-4)

Health	3
Flammability	1
Physical Hazard	0
Personal Protection	X

HMIS RATINGS (0-4)

### SECTION 3 : Composition/information on ingredients

#### Ingredients:

CAS 10326-27-9	Barium Chloride Dihydrate	100 %
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Percentages are by weight

### SECTION 4 : First aid measures

#### Description of first aid measures

**After inhalation:** Loosen clothing as necessary and position individual in a comfortable position. Remove to fresh air. Give artificial respiration if necessary. If breathing is difficult give oxygen. Seek medical attention. Do NOT use mouth - to - mouth resuscitation.

**After skin contact:** Wash affected area with soap and water. Rinse exposed skin with water for 20 minutes. Enter emergency shower rinsing while removing contaminated clothing and shoes. Transport victim to the hospital.

**After eye contact:** Protect unexposed eye. Rinse or flush exposed eye gently using water for 15-20 minutes. Occasionally lift the upper and lower eyelids while rinsing. Immediately seek medical attention.

**After swallowing:** Rinse mouth thoroughly. Do not induce vomiting. Do not perform mouth-to-mouth on an unconscious person. Never give anything by mouth to an unconscious person. Call Poison Control Center or a physician immediately.

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

Irritation. Nausea. Headache. Shortness of breath.; Eye, Skin, & Gastrointestinal irritation. Muscular stimulation

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

If seeking medical attention provide SDS document to physician.

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 12.21.2014

Page 3 of 7

## Barium Chloride Dihydrate

### SECTION 5 : Firefighting measures

#### Extinguishing media

**Suitable extinguishing agents:** Use water, dry chemical, chemical foam, or alcohol-resistant foam.

**For safety reasons unsuitable extinguishing agents:**

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

Substance is noncombustible; use agent most appropriate to extinguish surrounding fire. Decomposes at high temperatures, resulting in toxic and corrosive products.

#### Advice for firefighters:

**Protective equipment:** Wear protective eyewear, gloves, and clothing.

**Additional information (precautions):** Normal ventilation is adequate.

### SECTION 6 : Accidental release measures

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

Ensure that air-handling systems are operational. Ensure adequate ventilation.

#### Environmental precautions:

Prevent from reaching drains, sewer, or waterway. Should not be released into environment.

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

Wear protective eyewear, gloves, and clothing. Refer to Section 8. Always obey local regulations. If necessary use trained response staff or contractor. Evacuate personnel to safe areas. Containerize for disposal. Refer to Section 13. Keep in suitable closed containers for disposal.

#### Reference to other sections:

### SECTION 7 : Handling and storage

#### Precautions for safe handling:

Avoid contact with skin, eyes, and clothing. Follow good hygiene procedures when handling chemical materials. Refer to Section 8. Follow proper disposal methods. Refer to Section 13. Do not eat, drink, smoke, or use personal products when handling chemical substances. Avoid ingestion and inhalation.

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

Store in a cool location. Store in a cool location. Protect from freezing and physical damage. Provide ventilation for containers. Keep container tightly sealed. Store away from incompatible materials.

### SECTION 8 : Exposure controls/personal protection



#### Control Parameters:

10326-27-9, Barium chloride dihydrate, TWA 0.5 mg/m<sup>3</sup> USA. NIOSH 10326-27-9, Barium chloride dihydrate, WA 0.5 mg/m<sup>3</sup> USA. OSHA 10326-27-9, Barium chloride dihydrate, TWA 0.5 mg/m<sup>3</sup> USA. ACGIH

#### Appropriate Engineering controls:

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

#### Respiratory protection:

Normal ventilation is adequate.

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 12.21.2014

Page 4 of 7

## Barium Chloride Dihydrate

<b>Protection of skin:</b>	Select glove material impermeable and resistant to the substance. Select glove material based on rates of diffusion and degradation. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Use proper glove removal technique without touching outer surface. Avoid skin contact with used gloves. Wear protective clothing.
<b>Eye protection:</b>	Safety glasses with side shields or goggles. Wear equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).
<b>General hygienic measures:</b>	Wash hands before breaks and at the end of work. Avoid contact with skin, eyes, and clothing. Remove contaminated clothing and shoes. Before wearing wash contaminated clothing. Perform routine housekeeping.

### SECTION 9 : Physical and chemical properties

<b>Appearance (physical state,color):</b>	White solid	<b>Explosion limit lower: Explosion limit upper:</b>	Not Determined Not Determined
<b>Odor:</b>	Odorless	<b>Vapor pressure:</b>	Not Determined
<b>Odor threshold:</b>	Not Determined	<b>Vapor density:</b>	Not Determined
<b>pH-value:</b>	5.0 - 8.0 at 50 g/l at 25 °C	<b>Relative density:</b>	3.100 g/cm <sup>3</sup>
<b>Melting/Freezing point:</b>	962 °C	<b>Solubilities:</b>	Soluble in water
<b>Boiling point/Boiling range:</b>	1560 °C	<b>Partition coefficient (n-octanol/water):</b>	Not Determined
<b>Flash point (closed cup):</b>	Not Determined	<b>Auto/Self-ignition temperature:</b>	Not Determined
<b>Evaporation rate:</b>	Not Determined	<b>Decomposition temperature:</b>	> 100°C
<b>Flammability (solid,gaseous):</b>	Not Determined	<b>Viscosity:</b>	a. Kinematic: Not Determined b. Dynamic: Not Determined
<b>Density:</b> Not Determined			

### SECTION 10 : Stability and reactivity

**Reactivity:** Nonreactive under normal conditions.  
**Chemical stability:** Stable under normal conditions.  
**Possible hazardous reactions:** None under normal processing  
**Conditions to avoid:** Excessive heat. Incompatible materials. Dust formation.  
**Incompatible materials:** Oxidizing Agents  
**Hazardous decomposition products:** Hydrogen chloride gas, chlorine.

### SECTION 11 : Toxicological information

<b>Acute Toxicity:</b>		
<b>Oral:</b>	10326-27-9	LD50 oral - rat: 118 mg/kg

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 12.21.2014

Page 5 of 7

## Barium Chloride Dihydrate

<b>Chronic Toxicity:</b> No additional information.	
<b>Corrosion Irritation:</b> No additional information.	
<b>Sensitization:</b>	Irritation: Irritating to eyes and skin
<b>Single Target Organ (STOT):</b>	No additional information.
<b>Numerical Measures:</b>	No additional information.
<b>Carcinogenicity:</b>	No additional information.
<b>Mutagenicity:</b>	No additional information.
<b>Reproductive Toxicity:</b>	No additional information.

### SECTION 12 : Ecological information

**Ecotoxicity Persistence and degradability:** Readily degradable in the environment.

**Bioaccumulative potential:**

**Mobility in soil:**

**Other adverse effects:**

### SECTION 13 : Disposal considerations

#### Waste disposal recommendations:

It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities (US 40CFR262.11). Product or containers must not be disposed together with household garbage. Contact a licensed professional waste disposal service to dispose of this material. Consult federal, state, provincial, and local regulations regarding the proper disposal of waste material that may incorporate some amount of this product. Dilute with water and flush to sewer.

### SECTION 14 : Transport information

#### UN-Number

1564

#### UN proper shipping name

Barium Compounds, N.O.S.

#### Transport hazard class(es)



**Class:**

6.1 Toxic substances

**Packing group:** III

**Environmental hazard:**

**Transport in bulk:**

**Special precautions for user:**

### SECTION 15 : Regulatory information

#### United States (USA)

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

Acute, Chronic

## Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 12.21.2014

Page 6 of 7

### Barium Chloride Dihydrate

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

10326-27-9 Barium chloride dihydrate

**RCRA (hazardous waste code):**

10326-27-9, Not applicable

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

All ingredients are listed.

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

None of the ingredients is listed

**Proposition 65 (California):**

**Chemicals known to cause cancer:**

None of the ingredients is listed

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

None of the ingredients is listed

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

None of the ingredients is listed

**Chemicals known to cause developmental toxicity:**

None of the ingredients is listed

**Canada**

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

All ingredients are listed.

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

None of the ingredients is listed

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

None of the ingredients is listed

### SECTION 16 : Other information

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

**GHS Full Text Phrases:**

**Abbreviations and acronyms:**

IMDG: International Maritime Code for Dangerous Goods

PNEC: Predicted No-Effect Concentration (REACH)

CFR: Code of Federal Regulations (USA)

SARA: Superfund Amendments and Reauthorization Act (USA)

RCRA: Resource Conservation and Recovery Act (USA)

TSCA: Toxic Substances Control Act (USA)

## Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

**Effective date** : 12.21.2014

Page 7 of 7

### Barium Chloride Dihydrate

NPRI: National Pollutant Release Inventory (Canada)

DOT: US Department of Transportation

IATA: International Air Transport Association

GHS: Globally Harmonized System of Classification and Labelling of Chemicals

ACGIH: American Conference of Governmental Industrial Hygienists

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

NFPA: National Fire Protection Association (USA)

HMIS: Hazardous Materials Identification System (USA)

WHMIS: Workplace Hazardous Materials Information System (Canada)

DNEL: Derived No-Effect Level (REACH)

**Effective date** : 12.21.2014

**Last updated** : 03.23.2015



# Material Safety Data Sheet

## Benzene

ACC# 02610

### Section 1 - Chemical Product and Company Identification

**MSDS Name:** Benzene

**Catalog Numbers:** AC167660000, AC167660010, AC167660025, AC167660250, AC167665000, AC168650250, AC295330000, AC295330010, AC295330025, AC295330250, AC296880000, AC296880010, AC296880025, AC296880250, AC610230010, AC610231000, AC611001000, B243-4, B245-4, B245-500, B411-1, B411-4, B412-1, S79920ACS

**Synonyms:** Benzol; Cyclohexatriene; Phenyl hydride.**Company Identification:**

Fisher Scientific  
1 Reagent Lane  
Fair Lawn, NJ 07410

**For information, call:** 201-796-7100**Emergency Number:** 201-796-7100**For CHEMTREC assistance, call:** 800-424-9300**For International CHEMTREC assistance, call:** 703-527-3887

### Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
71-43-2	Benzene	> 99	200-753-7

### Section 3 - Hazards Identification

#### EMERGENCY OVERVIEW

Appearance: clear colorless liquid. Flash Point: -11 deg C.

**Danger!** Extremely flammable liquid and vapor. Vapor may cause flash fire. Harmful if swallowed, inhaled, or absorbed through the skin. Causes eye, skin, and respiratory tract irritation. Contains benzene. Benzene can cause cancer. Aspiration hazard if swallowed. Can enter lungs and cause damage. May cause blood abnormalities. May cause central nervous system effects.

**Target Organs:** Blood, central nervous system, respiratory system, eyes, bone marrow, immune system, skin.

#### Potential Health Effects

**Eye:** Causes eye irritation.

**Skin:** Causes skin irritation. Harmful if absorbed through the skin. Prolonged and/or repeated contact may cause defatting of the skin and dermatitis.

**Ingestion:** May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. May cause effects similar to those for inhalation exposure. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal.

**Inhalation:** Causes respiratory tract irritation. May cause drowsiness, unconsciousness, and central nervous system depression. Exposure may lead to irreversible bone marrow injury. Exposure may lead to aplastic anemia. Potential symptoms of overexposure by inhalation are dizziness, headache, vomiting, visual disturbances, staggering gait, hilarity, fatigue, and other symptoms of CNS depression.

**Chronic:** May cause bone marrow abnormalities with damage to blood forming tissues. May cause anemia

and other blood cell abnormalities. Chronic exposure to benzene has been associated with an increased incidence of leukemia and multiple myeloma (tumor composed of cells of the type normally found in the bone marrow). Immunodepressive effects have been reported. This substance has caused adverse reproductive and fetal effects in laboratory animals.

## Section 4 - First Aid Measures

**Eyes:** In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid.

**Skin:** In case of contact, flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical aid if irritation develops and persists. Wash clothing before reuse.

**Ingestion:** Potential for aspiration if swallowed. Get medical aid immediately. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If vomiting occurs naturally, have victim lean forward.

**Inhalation:** If inhaled, remove to fresh air. 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. Use water spray to keep fire-exposed containers cool. Extremely flammable liquid and vapor. Vapor may cause flash fire. Approach fire from upwind to avoid hazardous vapors and toxic decomposition products. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas. This liquid floats on water and may travel to a source of ignition and spread fire. May accumulate static electricity.

**Extinguishing Media:** Use water spray, dry chemical, carbon dioxide, or appropriate foam.

**Flash Point:** -11 deg C ( 12.20 deg F)

**Autoignition Temperature:** 498 deg C ( 928.40 deg F)

**Explosion Limits, Lower:** 1.3 vol %

**Upper:** 7.1 vol %

**NFPA Rating:** (estimated) Health: 2; Flammability: 3; 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. Avoid runoff into storm sewers and ditches which lead to waterways. Remove all sources of ignition. Provide ventilation. Approach spill from upwind. Use water spray to cool and disperse vapors, protect personnel, and dilute spills to form nonflammable mixtures.

## Section 7 - Handling and Storage

**Handling:** Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Take precautionary measures against static discharges. Keep container tightly closed. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Keep away from heat, sparks and flame. Avoid breathing vapor.

**Storage:** Keep away from sources of ignition. Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.

## Section 8 - Exposure Controls, Personal Protection

**Engineering Controls:** Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. See 29CFR 1910.1028 for the regulatory requirements for the control of employee exposure to benzene.

### Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Benzene	0.5 ppm TWA; 2.5 ppm STEL; Skin - potential significant contribution to overall exposure by the cutaneous route	0.1 ppm TWA 500 ppm IDLH	1 ppm TWA; 10 ppm TWA (applies to industry segments exempt from the benzene standard at 29 CFR 1910.1028); 25 ppm Ceiling (applies to industry segments exempt from the 1 ppm TWA and 5 ppm STEL of the benzene standard); 0.5 ppm Action Level; 1 ppm TWA; 5 ppm STEL (Cancer hazard, Flammable - see 29 CFR 1910.1028)

**OSHA Vacated PELs:** Benzene: 10 ppm TWA (unless specified in 1910.1028)

### 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

**Appearance:** clear colorless

**Odor:** sweetish odor - aromatic odor

**pH:** Not applicable.

**Vapor Pressure:** 75 mm Hg @ 20 deg C

**Vapor Density:** 2.8 (air=1)

**Evaporation Rate:** Not available.

**Viscosity:** 0.647mPa @ 20 deg C

**Boiling Point:** 80.1 deg C

**Freezing/Melting Point:** 5.5 deg C

**Decomposition Temperature:** Not available.

**Solubility:** 0.180 g/100 ml @ 25°C

**Specific Gravity/Density:** 0.8765 @ 20°C

**Molecular Formula:** C<sub>6</sub>H<sub>6</sub>

**Molecular Weight:** 78.11

## Section 10 - Stability and Reactivity

**Chemical Stability:** Stable under normal temperatures and pressures.  
**Conditions to Avoid:** Ignition sources, excess heat, confined spaces.  
**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#** 71-43-2: CY1400000

**LD50/LC50:**

CAS# 71-43-2:

Dermal, guinea pig: LD50 = >9400 uL/kg;  
Draize test, rabbit, eye: 88 mg Moderate;  
Draize test, rabbit, eye: 2 mg/24H Severe;  
Draize test, rabbit, skin: 20 mg/24H Moderate;  
Inhalation, mouse: LC50 = 9980 ppm;  
Inhalation, mouse: LC50 = 24 mL/kg/2H;  
Inhalation, rat: LC50 = 10000 ppm/7H;  
Inhalation, rat: LC50 = 34 mL/kg/2H;  
Inhalation, rat: LC50 = 6.5 mL/kg/4H;  
Oral, mouse: LD50 = 4700 mg/kg;  
Oral, rat: LD50 = 930 mg/kg;  
Oral, rat: LD50 = 1 mL/kg;

Oral, rat: LD50 = 1800 mg/kg. Benzene is considered very toxic; probable human oral lethal dose would be 50-500 mg/kg. Human inhalation of approximately 20,000 ppm (2% in air) was fatal in 5-10 minutes. While percutaneous absorption of liquid benzene through intact human skin can be limited (e.g., 0.05% of the applied dose), the absorbed dose via direct dermal contact combined with that received from body surface exposure to benzene in workplace air is such that a substantial fraction (20-40%) of the total exposure is due to skin absorption.

**Carcinogenicity:**

CAS# 71-43-2:

- **ACGIH:** A1 - Confirmed Human Carcinogen
- **California:** carcinogen, initial date 2/27/87
- **NTP:** Known carcinogen
- **IARC:** Group 1 carcinogen

**Epidemiology:** IARC has concluded that epidemiological studies have established the relationship between benzene exposure and the development of acute myelogenous leukemia, and that there is sufficient evidence that benzene is carcinogenic to humans.

**Teratogenicity:** Inhalation, rat: TCLO = 50 ppm/24H (female 7-14 day(s) after conception) Effects on Embryo or Fetus - extra-embryonic structures (e.g., placenta, umbilical cord) and Effects on Embryo or Fetus - fetotoxicity (except death, e.g., stunted fetus).; Inhalation, mouse: TCLO = 5 ppm (female 6-15 day(s) after conception) Effects on Embryo or Fetus - cytological changes (including somatic cell genetic material) and Specific Developmental Abnormalities - blood and lymphatic systems (including spleen and marrow).

**Reproductive Effects:** Inhalation, rat: TCLO = 670 mg/m<sup>3</sup>/24H (female 15 day(s) pre-mating and female 1-22 day(s) after conception) female fertility index (e.g. # females pregnant per # sperm positive females; # females pregnant per # females mated).; Oral, mouse: TDLo = 12 gm/kg (female 6-15 day(s) after conception) Fertility - post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants).

**Mutagenicity:** DNA Inhibition: Human, Leukocyte = 2200 umol/L.; DNA Inhibition: Human, HeLa cell = 2200 umol/L.; Mutation Test Systems - not otherwise specified: Human, Lymphocyte = 5 umol/L.; Cytogenetic Analysis: Inhalation, Human = 125 ppm/1Y.; Cytogenetic Analysis: Human, Leukocyte = 1 mmol/L/72H.; Cytogenetic Analysis: Human, Lymphocyte = 1 mg/L.

**Neurotoxicity:** See actual entry in RTECS for complete information.

**Other Studies:**

## Section 12 - Ecological Information

**Ecotoxicity:** Fish: Mosquito Fish: TLm = 395 mg/L; 24 Hr; UnspecifiedFish: Goldfish: LC50 =46 mg/L; 24 Hr; Modified ASTM D 1345Fish: Fathead Minnow: LC50 = 15.1 mg/L; 96 Hr; Flow-through at 25°C (pH 7.9-8.0)Fish: Rainbow trout: LC50 = 5.3 mg/L; 96 Hr; Flow-through at 25°C (pH 7.9-8.0)Fish: Bluegill/Sunfish: LD50 = 20 mg/L; 24-48 Hr; Unspecified If benzene is released to soil, it will be subject to rapid volatilization near the surface and that which does not evaporate will be highly to very highly mobile in the soil and may leach to groundwater. If benzene is released to water, it will be subject to rapid volatilization. It will not be expected to significantly adsorb to sediment, bioconcentrate in aquatic organisms or hydrolyze. It may be subject to biodegradation.

**Environmental:** If benzene is released to the atmosphere, it will exist predominantly in the vapor phase. Gas-phase benzene will not be subject to direct photolysis but it will react with photochemically produced hydroxyl radicals with a half-life of 13.4 days. The reaction time in polluted atmospheres which contain nitrogen oxides or sulfur dioxide is accelerated with the half-life being reported as 4-6 hours. Benzene is fairly soluble in water and is removed from the atmosphere in rain.

**Physical:** Products of photooxidation include phenol, nitrophenols, nitrobenzene, formic acid, and peroxyacetyl nitrate.

**Other:** 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# 71-43-2: waste number U019 (Ignitable waste, Toxic waste).

## Section 14 - Transport Information

	US DOT	Canada TDG
<b>Shipping Name:</b>	BENZENE	BENZENE
<b>Hazard Class:</b>	3	3
<b>UN Number:</b>	UN1114	UN1114
<b>Packing Group:</b>	II	II
<b>Additional Info:</b>		FLASHPOINT -11 C

## Section 15 - Regulatory Information

### US FEDERAL

#### TSCA

CAS# 71-43-2 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# 71-43-2: 10 lb final RQ (received an adjusted RQ of 10 lbs based on potential carcinogen)

**SARA Section 302 Extremely Hazardous Substances**

None of the chemicals in this product have a TPQ.

**SARA Codes**

CAS # 71-43-2: immediate, delayed, fire.

**Section 313**

This material contains Benzene (CAS# 71-43-2, > 99%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

**Clean Air Act:**

CAS# 71-43-2 is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depleters.

This material does not contain any Class 2 Ozone depleters.

**Clean Water Act:**

CAS# 71-43-2 is listed as a Hazardous Substance under the CWA. CAS# 71-43-2 is listed as a Priority Pollutant under the Clean Water Act. CAS# 71-43-2 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**

CAS# 71-43-2 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 Benzene, a chemical known to the state of California to cause cancer.

WARNING: This product contains Benzene, a chemical known to the state of California to cause male reproductive toxicity.

California No Significant Risk Level: CAS# 71-43-2: 6.4  $\mu$ g/day NSRL (oral); 13  $\mu$ g/day NSRL (inhalation)

**European/International Regulations****European Labeling in Accordance with EC Directives****Hazard Symbols:**

T F

**Risk Phrases:**

R 11 Highly flammable.

R 36/38 Irritating to eyes and skin.

R 45 May cause cancer.

R 46 May cause heritable genetic damage.

R 48/23/24/25 Toxic : danger of serious damage to health by prolonged exposure through inhalation, contact with skin and if swallowed.

R 65 Harmful: may cause lung damage if swallowed.

**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.

**WGK (Water Danger/Protection)**

CAS# 71-43-2: 3

**Canada - DSL/NDSL**

CAS# 71-43-2 is listed on Canada's DSL List.

**Canada - WHMIS**

This product has a WHMIS classification of B2, D2A, D2B.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

**Canadian Ingredient Disclosure List**

CAS# 71-43-2 is listed on the Canadian Ingredient Disclosure List.

<b>Section 16 - Additional Information</b>
--------------------------------------------

**MSDS Creation Date:** 6/11/1999

**Revision #8 Date:** 9/11/2008

*The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.*

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 10.24.2014

Page 1 of 7

## Chromium, Reagent Grade,

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

**Product name :** Chromium, Reagent Grade,

**Manufacturer/Supplier Trade name:**

**Manufacturer/Supplier Article number: S25249A**

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

**Manufacturer Details:**

AquaPhoenix Scientific  
9 Barnhart Drive, Hanover, PA 17331

**Supplier Details:**

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

**Emergency telephone number:**

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

### SECTION 2 : Hazards identification

**Classification of the substance or mixture:**



**Environmentally Damaging**

Chronic hazards to the aquatic environment, category 1  
Acute hazards to the aquatic environment, category 1

Aquatic Acute 1

Aquatic Chronic 1

**Signal word :**Warning

**Hazard statements:**

Very toxic to aquatic life with long lasting effects

**Precautionary statements:**

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

Keep out of reach of children

Read label before use

Do not eat, drink or smoke when using this product

Avoid release to the environment

Collect spillage

Dispose of contents and container to an approved waste disposal plant

**Other Non-GHS Classification:**

**WHMIS  
NFPA/HMIS**



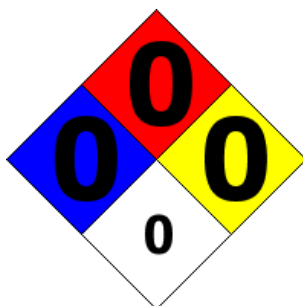
# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 10.24.2014

Page 2 of 7

## Chromium, Reagent Grade,



NFPA SCALE (0-4)

Health	0
Flammability	0
Physical Hazard	0
Personal Protection	X

HMIS RATINGS (0-4)

### SECTION 3 : Composition/information on ingredients

#### Ingredients:

CAS 7440-47-3	Chromium	>98 %
Percentages are by weight		

### SECTION 4 : First aid measures

#### Description of first aid measures

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

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

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

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

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

Irritation, Nausea, Headache, Shortness of breath.;

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

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

### SECTION 5 : Firefighting measures

#### Extinguishing media

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

**For safety reasons unsuitable extinguishing agents:**

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

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

#### Advice for firefighters:

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

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 10.24.2014

Page 3 of 7

## Chromium, Reagent Grade,

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

### SECTION 6 : Accidental release measures

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

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

#### Environmental precautions:

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

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

Keep in suitable closed containers for disposal. Wear protective eyewear, gloves, and clothing. Refer to Section 8. Always obey local regulations. Evacuate personnel to safe areas.

#### Reference to other sections:

### SECTION 7 : Handling and storage

#### Precautions for safe handling:

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

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

Store away from incompatible materials. Protect from freezing and physical damage. Keep away from food and beverages. Provide ventilation for containers. Store in cool, dry conditions in well sealed containers. Store with like hazards

### SECTION 8 : Exposure controls/personal protection



#### Control Parameters:

7440-47-3, Chromium, NIOSH REL: TWA 0.5 mg/m<sup>3</sup>

#### Appropriate Engineering controls:

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

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 10.24.2014

Page 4 of 7

## Chromium, Reagent Grade,

<b>Respiratory protection:</b>	Not required under normal conditions of use. Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. When necessary use NIOSH approved breathing equipment.
<b>Protection of skin:</b>	Select glove material impermeable and resistant to the substance. Select glove material based on rates of diffusion and degradation. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Use proper glove removal technique without touching outer surface. Avoid skin contact with used gloves. Wear protective clothing.
<b>Eye protection:</b>	Wear equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses or goggles are appropriate eye protection.
<b>General hygienic measures:</b>	Perform routine housekeeping. Wash hands before breaks and at the end of work. Avoid contact with skin, eyes, and clothing. Before wearing wash contaminated clothing.

### SECTION 9 : Physical and chemical properties

<b>Appearance (physical state,color):</b>	Silver-gray solid	<b>Explosion limit lower: Explosion limit upper:</b>	Not determined Not determined
<b>Odor:</b>	Not Determined	<b>Vapor pressure:</b>	Not determined
<b>Odor threshold:</b>	Not determined	<b>Vapor density:</b>	Negligible
<b>pH-value:</b>	Not Determined	<b>Relative density:</b>	Not determined
<b>Melting/Freezing point:</b>	1857.2°C (3374.96°F)	<b>Solubilities:</b>	insoluble
<b>Boiling point/Boiling range:</b>	2642°C (4787.6°F)	<b>Partition coefficient (n-octanol/water):</b>	Not determined
<b>Flash point (closed cup):</b>	Not determined	<b>Auto/Self-ignition temperature:</b>	Not determined
<b>Evaporation rate:</b>	Not determined	<b>Decomposition temperature:</b>	Not determined
<b>Flammability (solid,gaseous):</b>	Not determined	<b>Viscosity:</b>	a. Kinematic: Not determined b. Dynamic: Not determined
<b>Density:</b> 7.2 @ 28°C			

### SECTION 10 : Stability and reactivity

**Reactivity:** Nonreactive under normal conditions.  
**Chemical stability:** Stable under normal conditions.  
**Possible hazardous reactions:** None under normal processing  
**Conditions to avoid:** Incompatible Materials.  
**Incompatible materials:** Strong acids. Strong bases. Oxidizing agents.  
**Hazardous decomposition products:**

### SECTION 11 : Toxicological information

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 10.24.2014

Page 5 of 7

## Chromium, Reagent Grade,

**Acute Toxicity:** No additional information.

**Chronic Toxicity:** No additional information.

**Corrosion Irritation:** No additional information.

**Sensitization:** No additional information.

**Single Target Organ (STOT):** No additional information.

**Numerical Measures:** No additional information.

**Carcinogenicity:** No additional information.

**Mutagenicity:** No additional information.

**Reproductive Toxicity:** No additional information.

## SECTION 12 : Ecological information

### Ecotoxicity

**Toxicity to fish:** LC50 - Cyprinus carpio (Carp) - 14.3 mg/l - 96 h

**Persistence and degradability:**

**Bioaccumulative potential:**

**Mobility in soil:**

**Other adverse effects:**

## SECTION 13 : Disposal considerations

### Waste disposal recommendations:

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

## SECTION 14 : Transport information

### UN-Number

3077

### UN proper shipping name

ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Chromium)

### Transport hazard class(es)



**Class:**

9 Miscellaneous dangerous substances and articles

**Packing group:** Marine pollutant

**Environmental hazard:**

**Transport in bulk:**

**Special precautions for user:**

## SECTION 15 : Regulatory information

## Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 10.24.2014

Page 6 of 7

### Chromium, Reagent Grade,

#### United States (USA)

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

None of the ingredients is listed

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

None of the ingredients is listed

**RCRA (hazardous waste code):**

None of the ingredients is listed

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

All ingredients are listed.

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

7440-47-3 Chromium: RQ 5000 LB

#### Proposition 65 (California):

**Chemicals known to cause cancer:**

None of the ingredients is listed

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

None of the ingredients is listed

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

None of the ingredients is listed

**Chemicals known to cause developmental toxicity:**

None of the ingredients is listed

#### Canada

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

All ingredients are listed.

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

7440-47-3 Chromium

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

None of the ingredients is listed

### SECTION 16 : Other information

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

**GHS Full Text Phrases:**

**Abbreviations and acronyms:**

IMDG: International Maritime Code for Dangerous Goods

IATA: International Air Transport Association

## Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

**Effective date** : 10.24.2014

Page 7 of 7

### Chromium, Reagent Grade,

GHS: Globally Harmonized System of Classification and Labelling of Chemicals

ACGIH: American Conference of Governmental Industrial Hygienists

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

NFPA: National Fire Protection Association (USA)

HMIS: Hazardous Materials Identification System (USA)

WHMIS: Workplace Hazardous Materials Information System (Canada)

DNEL: Derived No-Effect Level (REACH)

PNEC: Predicted No-Effect Concentration (REACH)

CFR: Code of Federal Regulations (USA)

SARA: Superfund Amendments and Reauthorization Act (USA)

RCRA: Resource Conservation and Recovery Act (USA)

TSCA: Toxic Substances Control Act (USA)

NPRI: National Pollutant Release Inventory (Canada)

DOT: US Department of Transportation

**Effective date** : 10.24.2014

**Last updated** : 03.19.2015

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 03.02.2015

Page 1 of 9

## Copper, Metal Foil

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

**Product name:** Copper, Metal Foil

**Manufacturer/Supplier Trade name:**

**Manufacturer/Supplier Article number:** S25267

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

**Manufacturer Details:**

AquaPhoenix Scientific, Inc  
9 Barnhart Drive, Hanover, PA 17331  
(717) 632-1291

**Supplier Details:**

Fisher Science Education  
6771 Silver Crest Road, Nazareth, PA 18064  
(724)517-1954

**Emergency telephone number:**

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

### SECTION 2: Hazards identification

**Classification of the substance or mixture:**



**Toxic**

Acute toxicity (oral, dermal, inhalation), category 2



**Irritant**

Eye irritation, category 2A  
Skin sensitization, category 1



**Health hazard**

Germ cell mutagenicity, category 1A  
Specific target organ toxicity following repeated exposure, category 2

Acute toxicity - Oral - Category 2: H300 Fatal if swallowed.

Acute toxicity - Inhalation - Category 2: H330 Fatal if inhaled.

Specific target organ toxicity - Repeated exposure - (Oral,Inhalation) - Category 2: H373 May cause damage to digestive system, hematopoietic system, kidneys, nose, respiratory system, and/or skin through prolonged or repeated exposure if inhaled.

Hazards Not Otherwise Classified - Combustible Dust.

Not classified for physical or health hazards under GHS.

Hazards Not Otherwise Classified - Combustible Dust.

Serious Eye Damage/Eye Irritation - Category 2: H319 Causes serious eye irritation.

Skin sensitizers - Category 1: H317 May cause allergic skin reaction.

Germ cell mutagenicity - Category 1: H340 May cause genetic defects.

Hazardous to aquatic environment - acute hazard - Category 1: H400 Very toxic to aquatic life.

**Signal word:** Danger

**Hazard statements:**

Fatal if swallowed.

Fatal if inhaled.

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 03.02.2015

Page 2 of 9

## Copper, Metal Foil

May cause an allergic skin reaction.  
Causes serious eye irritation.  
May cause genetic defects.  
May cause damage to organs through prolonged or repeated exposure.  
Very toxic to aquatic life.

### Precautionary statements:

If medical advice is needed, have product container or label at hand.  
Keep out of reach of children.  
Read label before use.  
If medical advice is needed, have product container or label at hand.  
Keep out of reach of children.  
Read label before use.  
Wash skin thoroughly after handling.  
Avoid release to the environment.  
Do not eat, drink or smoke when using this product.  
Do not eat, drink or smoke when using this product.  
Use only outdoors or in a well-ventilated area.  
Wear protective gloves/protective clothing/eye protection/face protection.  
Avoid breathing dust/fume/gas/mist/vapours/spray.  
Use only outdoors or in a well-ventilated area.  
Obtain special instructions before use.  
Do not handle until all safety precautions have been read and understood.  
Use personal protective equipment as required.  
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.  
Wash contaminated clothing before reuse.  
IF exposed or concerned: Get medical advice/attention.  
Collect spillage.  
Specific treatment (see supplemental first aid instructions on this label).  
Rinse mouth.  
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 IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do.  
Continue rinsing.  
If eye irritation persists get medical advice/attention.  
IF ON SKIN: Wash with soap and water.  
If skin irritation or a rash occurs: Get medical advice/attention.  
Store locked up.  
Dispose of contents and container as instructed in Section 13.

### Other Non-GHS Classification:

#### WHMIS



#### NFPA/HMIS



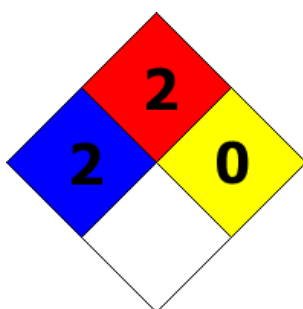
# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 03.02.2015

Page 3 of 9

## Copper, Metal Foil



NFPA SCALE (0-4)

Health	2
Flammability	2
Physical Hazard	0
Personal Protection	X

HMIS RATINGS (0-4)

### SECTION 3: Composition/information on ingredients

#### Ingredients:

CAS 7440-50-8

Copper

100 %

Percentages are by weight

### SECTION 4: First aid measures

#### Description of first aid measures

##### After inhalation:

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

##### After skin contact:

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

##### After eye contact:

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

##### After swallowing:

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

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

Irritation. Nausea. Headache. Shortness of breath.

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

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

### SECTION 5: Firefighting measures

#### Extinguishing media

##### Suitable extinguishing agents:

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

##### Unsuitable extinguishing agents:

None identified.

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

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 03.02.2015

Page 4 of 9

## Copper, Metal Foil

Oxides of copper. Combustion products may include carbon oxides or other toxic vapors. Thermal decomposition can lead to release of irritating gases and vapors. Dust can be an explosion hazard when exposed to heat or flame. Noncombustible solid in bulk form, but powdered form may ignite.

### Advice for firefighters:

#### Protective equipment:

Use NIOSH-approved respiratory protection/breathing apparatus.

#### Additional information (precautions):

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

## SECTION 6: Accidental release measures

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

Wear protective equipment. Use spark-proof tools and explosion-proof equipment. Ensure that air-handling systems are operational. Ensure adequate ventilation.

### Environmental precautions:

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

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

Keep in suitable closed containers for disposal. Wear protective eyewear, gloves, and clothing. Refer to Section 8. Always obey local regulations. Dust deposits should not be allowed to accumulate on surfaces, as these may form an explosive mixture if they are released into the atmosphere in sufficient concentration. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). Collect solids in powder form using vacuum with (HEPA filter). Evacuate personnel to safe areas. 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.

### Reference to other sections: None

## SECTION 7: Handling and storage

### Precautions for safe handling:

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

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

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

## SECTION 8: Exposure controls/personal protection



# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 03.02.2015

Page 5 of 9

## Copper, Metal Foil

<b>Control Parameters:</b>	7440-50-8 , Copper , OSHA PEL TWA (Total Dust) TWA 1 mg/m3. 7440-50-8, Copper, ACGIH TLV: 0.2 mg/m3 TWA (fume); 1 mg/m3 TWA (dusts and mists). 7440-50-8, Copper, OSHA PEL: 0.1 mg/m3 TWA (fume).
<b>Appropriate Engineering controls:</b>	Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use/handling. Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapor or dusts (total/respirable) below the applicable workplace exposure limits (Occupational Exposure Limits-OELs) indicated above. It is recommended that all dust control equipment such as local exhaust ventilation and material transport systems involved in handling of this product contain explosion relief vents or an explosion suppression system or an oxygen deficient environment. Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is no leakage from the equipment). Use under a fume hood.
<b>Respiratory protection:</b>	Not required under normal conditions of use. Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. When necessary use NIOSH approved breathing equipment.
<b>Protection of skin:</b>	Select glove material impermeable and resistant to the substance. Select glove material based on rates of diffusion and degradation. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Use proper glove removal technique without touching outer surface. Avoid skin contact with used gloves. Wear protective clothing.
<b>Eye protection:</b>	Wear equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses or goggles are appropriate eye protection.
<b>General hygienic measures:</b>	Perform routine housekeeping. Wash hands before breaks and at the end of work. Avoid contact with skin, eyes, and clothing. Before wearing wash contaminated clothing.

## SECTION 9: Physical and chemical properties

<b>Appearance (physical state, color):</b>	Red to brown solid	<b>Explosion limit lower:</b>	Not determined
		<b>Explosion limit upper:</b>	Not determined
<b>Odor:</b>	Odorless	<b>Vapor pressure at 20°C:</b>	Not determined
<b>Odor threshold:</b>	Not determined	<b>Vapor density:</b>	Not determined
<b>pH-value:</b>	Not determined	<b>Relative density:</b>	Not determined
<b>Melting/Freezing point:</b>	1083°C (1981.4°F)	<b>Solubilities:</b>	Insoluble.
<b>Boiling point/Boiling range:</b>	2595°C (4703°F)	<b>Partition coefficient (n-octanol/water):</b>	Not determined
<b>Flash point (closed cup):</b>	Not determined	<b>Auto/Self-ignition temperature:</b>	Not determined
<b>Evaporation rate:</b>	Not determined	<b>Decomposition temperature:</b>	Not determined
<b>Flammability (solid, gaseous):</b>	Not determined	<b>Viscosity:</b>	a. Kinematic: Not determined b. Dynamic: Not determined
<b>Density at 20°C:</b>	8.94 (Water = 1)		

## SECTION 10: Stability and reactivity

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 03.02.2015

Page 6 of 9

## Copper, Metal Foil

### Reactivity:

Stable at room temperature in closed containers under normal storage and handling conditions.

### Chemical stability:

Stable under normal conditions.

### Possible hazardous reactions:

None under normal processing.

### Conditions to avoid:

Incompatible Materials. Dust formation. Moisture. Exposure to air.

### Incompatible materials:

Liquid copper explodes on contact with water. Reacts violently with ammonium nitrate, bromates, iodates, chlorates, ethylene oxide, hydrazoic acid, potassium oxide, dimethyl sulfoxide Page 3 of 4 CU4500 + trichloroacetic acid, hydrogen peroxide, sodium peroxide, sodium azide, sulfuric acid, hydrogen sulfide + air, and lead azide. Ignites on contact with chlorine, fluorine (above 121C), chlorine trifluoride, and hydrazinium nitrate (above 70C). Incompatible with 1-bromo-2-propyne, potassium dioxide, and acetylenic compounds.

### Hazardous decomposition products:

Oxides of copper.

## SECTION 11: Toxicological information

### Acute Toxicity:

#### Oral:

7440-50-8 LD50, Rat 472mg/KG

### Chronic Toxicity:

#### Oral:

7440-50-8 Chronic copper poisoning is typified by hepatic cirrhosis, brain damage and demyelination, kidney defects, and copper deposition in the cornea as exemplified by humans with Wilson's disease. It has also been reported that copper poisoning has led to hemolytic anemia and accelerates arteriosclerosis.

### Corrosion Irritation:

#### Dermal:

7440-50-8 Dust is irritating to the respiratory tract. Inhalation of fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain and increased white blood cell count.

**Sensitization:** No additional information.

**Numerical Measures:** No additional information.

**Carcinogenicity:** No additional information.

### Mutagenicity:

Please refer to RTECS# BO9000000 for specific informaton.

### Reproductive Toxicity:

Fertility: Post-implantation mortality, oral-rat TDLo=40mg/kg.

## SECTION 12: Ecological information

### Ecotoxicity:

Freshwater fish: 96 Hr LC50 Pimephales promelas: 0.0068 - 0.0156 mg/L; 96 Hr LC50 Pimephales promelas: <0.3 mg/L [static]; 96 Hr LC50 Pimephales promelas: 0.2 mg/L [flow-through]; 96 Hr LC50 Oncorhynchus

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 03.02.2015

Page 7 of 9

## Copper, Metal Foil

mykiss: 0.052 mg/L [flow-through]; 96 Hr LC50 Lepomis macrochirus: 1.25 mg/L [static]; 96 Hr LC50 Cyprinus carpio: 0.3 mg/L [semi-static]; 96 Hr LC50 Cyprinus carpio: 0.8 mg/L [static]; 96 Hr LC50 Poecilia reticulata: 0.112 mg/L [flow-through]

Water flea: 48 Hr EC50 Daphnia magna: 0.03 mg/L [Static]

### Persistence and degradability:

No information available.

### Bioaccumulative potential:

No information available.

**Mobility in soil:** No additional information.

### Other adverse effects:

No information available.

## SECTION 13: Disposal considerations

### Waste disposal recommendations:

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

## SECTION 14: Transport information

### US DOT

#### UN Number:

ADR, ADN, DOT, IMDG, IATA 3089

**Limited Quantity Exception:** None

#### Bulk:

**RQ (if applicable):** None

**Proper shipping Name:** Metal Powder, Flammable, NOS (Copper Sulfate).

**Hazard Class:** 4

**Packing Group:** II.

**Marine Pollutant (if applicable):** No additional information.

**Comments:** None

#### Non Bulk:

**RQ (if applicable):** None

**Proper shipping Name:** Metal Powder, Flammable, NOS (Copper Sulfate).

**Hazard Class:** 4

**Packing Group:** II.

**Marine Pollutant (if applicable):** No additional information.

**Comments:** None



## SECTION 15: Regulatory information

### United States (USA)

## Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 03.02.2015

Page 8 of 9

### Copper, Metal Foil

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

Acute, Chronic, Fire

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

None of the ingredients are listed.

#### RCRA (hazardous waste code):

None of the ingredients are listed.

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

All ingredients are listed.

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

7440-50-8 Copper Sulfate 5000 Lbs.

#### Proposition 65 (California):

##### Chemicals known to cause cancer:

None of the ingredients are listed.

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

None of the ingredients are listed.

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

None of the ingredients are listed.

##### Chemicals known to cause developmental toxicity:

None of the ingredients are listed.

#### Canada

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

All ingredients are listed.

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

None of the ingredients are listed.

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

None of the ingredients are listed.

### SECTION 16: Other information

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

**GHS Full Text Phrases:** None

#### Abbreviations and Acronyms:

IMDG International Maritime Code for Dangerous Goods.

PNEC Predicted No-Effect Concentration (REACH).

## Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

**Effective date** : 03.02.2015

Page 9 of 9

### Copper, Metal Foil

CFR Code of Federal Regulations (USA).  
SARA Superfund Amendments and Reauthorization Act (USA).  
RCRA Resource Conservation and Recovery Act (USA).  
TSCA Toxic Substances Control Act (USA).  
NPRI National Pollutant Release Inventory (Canada).  
DOT US Department of Transportation.  
IATA International Air Transport Association.  
GHS Globally Harmonized System of Classification and Labelling of Chemicals.  
ACGIH American Conference of Governmental Industrial Hygienists.  
CAS Chemical Abstracts Service (division of the American Chemical Society).  
NFPA National Fire Protection Association (USA).  
HMIS Hazardous Materials Identification System (USA).  
WHMIS Workplace Hazardous Materials Information System (Canada).  
DNEL Derived No-Effect Level (REACH).

**Effective date:** 03.02.2015

**Last updated:** 06.17.2015

# SAFETY DATA SHEET

Version 6.2  
Revision Date 10/05/2020  
Print Date 08/21/2021

## SECTION 1: Identification of the substance/mixture and of the company/undertaking

### 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, 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

Synonyms : Diphenylene oxide

Formula : C<sub>12</sub>H<sub>8</sub>O



Molecular weight : 168.19 g/mol  
CAS-No. : 132-64-9  
EC-No. : 205-071-3

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

### 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

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.

---

## SECTION 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.

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

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: Dermatrill® (KCL 740 / Aldrich Z677272, Size M)

##### Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatrill® (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**

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.

---

## **SECTION 9: Physical and chemical properties**

### **9.1 Information on basic physical and chemical properties**

- |                                                 |                                                       |
|-------------------------------------------------|-------------------------------------------------------|
| a) Appearance                                   | Form: powder, finocrystalline<br>Color: white, beige  |
| b) Odor                                         | No data available                                     |
| c) Odor 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 - lit.            |
| g) Flash point                                  | 130 °C (266 °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) Vapor pressure                               | No data available                                     |
| l) Vapor density                                | No data available                                     |
| m) Relative density                             | 1.3 g/cm <sup>3</sup> at 20 °C (68 °F)                |
| n) Water solubility                             | insoluble                                             |
| o) Partition coefficient: n-octanol/water       | log Pow: 4.12 - (Lit.), Potential bioaccumulation     |
| 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

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.

Hazardous properties cannot be excluded.

Handle in accordance with good industrial hygiene and safety practice.

---

**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 ecological problems are to be expected when the product is handled and used with due care and attention.

---

**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)

UN number: 3077 Class: 9 Packing group: III  
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Dibenzofuran)  
Reportable Quantity (RQ): 100 lbs  
Poison Inhalation Hazard: No

#### IMDG

Not dangerous goods

#### IATA

Not dangerous goods

---

### SECTION 15: Regulatory information

#### SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

#### 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

No SARA Hazards

#### 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
Dibenzofuran	132-64-9	2007-07-01

---

### SECTION 16: Other information

#### Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See

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Version: 6.2

Revision Date: 10/05/2020

Print Date: 08/21/2021

# Material Safety Data Sheet

## Ethylbenzene

ACC# 00596

### Section 1 - Chemical Product and Company Identification

**MSDS Name:** Ethylbenzene**Catalog Numbers:** AC118080000, AC118080025, AC118080250, AC118080251, AC118085000, 11808-0010, O2751-1**Synonyms:** Ethylbenzol; Phenylethane.**Company Identification:**

Fisher Scientific  
1 Reagent Lane  
Fair Lawn, NJ 07410

**For information, call:** 201-796-7100**Emergency Number:** 201-796-7100**For CHEMTREC assistance, call:** 800-424-9300**For International CHEMTREC assistance, call:** 703-527-3887

### Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
100-41-4	Ethylbenzene	>99	202-849-4

### Section 3 - Hazards Identification

#### EMERGENCY OVERVIEW

Appearance: clear, colorless liquid. Flash Point: 15 deg C.

**Warning! Flammable liquid and vapor.** Causes eye, skin, and respiratory tract irritation. May be harmful if inhaled. Aspiration hazard if swallowed. Can enter lungs and cause damage. May cause central nervous system depression.

**Target Organs:** Central nervous system.

#### Potential Health Effects

**Eye:** Causes severe eye irritation. Causes redness and pain.**Skin:** Causes skin irritation. Prolonged and/or repeated contact may cause irritation and/or dermatitis. May be absorbed through the skin. Causes redness and pain.**Ingestion:** May cause irritation of the digestive tract. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal.**Inhalation:** Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. Causes respiratory tract irritation. Vapors may cause dizziness or suffocation.**Chronic:** Chronic inhalation may cause effects similar to those of acute inhalation.

### 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 immediately.

**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 immediately.

**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. Use water spray to keep fire-exposed containers cool. Flammable liquid and vapor. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas. This liquid floats on water and may travel to a source of ignition and spread fire. May accumulate static electricity.

**Extinguishing Media:** Use water spray, dry chemical, carbon dioxide, or appropriate foam.

**Flash Point:** 15 deg C ( 59.00 deg F)

**Autoignition Temperature:** 432 deg C ( 809.60 deg F)

**Explosion Limits, Lower:** 1.2%

**Upper:** 6.8%

**NFPA Rating:** (estimated) Health: 2; Flammability: 3; 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. Remove all sources of ignition. Provide ventilation. Control runoff and isolate discharged material for proper disposal. Use water spray to cool and disperse vapors and protect personnel.

## Section 7 - Handling and Storage

**Handling:** Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Ground and bond containers when transferring material. 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. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Avoid breathing vapor or mist.

**Storage:** Keep away from sources of ignition. Store in a tightly closed container. Keep from contact with oxidizing materials. 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 general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

### Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs

Ethylbenzene	100 ppm TWA; 125 ppm STEL	100 ppm TWA; 435 mg/m <sup>3</sup> TWA 800 ppm IDLH	100 ppm TWA; 435 mg/m <sup>3</sup> TWA
--------------	---------------------------	-----------------------------------------------------	----------------------------------------

**OSHA Vacated PELs:** Ethylbenzene: 100 ppm TWA; 435 mg/m<sup>3</sup> TWA

**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:** 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:** Liquid

**Appearance:** clear, colorless

**Odor:** aromatic odor

**pH:** Not available.

**Vapor Pressure:** 9.6 mm Hg @ 25 deg C

**Vapor Density:** 3.7 (air=1)

**Evaporation Rate:** <1 (butyl acetate=1)

**Viscosity:** 0.63 mPa s 20 C

**Boiling Point:** 136 deg C

**Freezing/Melting Point:** -95 deg C

**Decomposition Temperature:** Not available.

**Solubility:** Insoluble.

**Specific Gravity/Density:** 0.86

**Molecular Formula:** C<sub>8</sub>H<sub>10</sub>

**Molecular Weight:** 106.17

## 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 dioxide.

**Hazardous Polymerization:** Has not been reported.

## Section 11 - Toxicological Information

**RTECS#:**

**CAS#** 100-41-4: DA0700000

**LD50/LC50:**

CAS# 100-41-4:

Draize test, rabbit, eye: 500 mg Severe;

Inhalation, mouse: LC50 = 35500 mg/m<sup>3</sup>/2H;

Inhalation, rat: LC50 = 55000 mg/m<sup>3</sup>/2H;

Oral, rat: LD50 = 3500 mg/kg;

Oral, rat: LD50 = 3500 mg/kg;

Skin, rabbit: LD50 = 17800 uL/kg;

Inhalation rat LC50: 17.2 mg/l/4H from BASF.

**Carcinogenicity:**

CAS# 100-41-4:

- **ACGIH:** A3 - Confirmed animal carcinogen with unknown relevance to humans
- **California:** carcinogen, initial date 6/11/04
- **NTP:** Not listed.
- **IARC:** Group 2B carcinogen

**Epidemiology:** No information found

**Teratogenicity:** No information found

**Reproductive Effects:** No information found

**Mutagenicity:** Mutation in mammalian somatic cells(Rodent,mouse) Lymphocyte = 80 mg/L.

**Neurotoxicity:** No information found

**Other Studies:**

## Section 12 - Ecological Information

**Ecotoxicity:** Fish: Rainbow trout: LC50 = 14.0 mg/L; 96 Hr.; Static Bioassay Fish: Fathead Minnow: LC50 = 12.1 mg/L; 96 Hr.; Flow-through Bioassay Fish: Bluegill/Sunfish: LC50 = 150.0 mg/L; 96 Hr.; Static Bioassay, pH 6.5-7.9, 21-23 degrees C Water flea EC50 = 2.1 mg/L; 48 Hr.; Static Bioassay Water flea EC50 = 75.0 mg/L; 48 Hr.; Static Bioassay Shrimp (mysidoposis bahia), LC50=87.6 mg/L/96hr. Sheepshead minnow LC50=275 mg/L/96hr. Fathead minnow LC50=42.3 mg/L/96hr in hard water & 48.5 mg/L/96hr in softwater.

**Environmental:** Experimental data on the bioconcentration of ethylbenzene include a log BCF of 1.9 in goldfish and the log BCF of 0.67 for clams exposed to the water-soluble fraction of crude oil. Using its octanol/water partition coefficient (log Kow= 3.15) and using a recommended regression equation, one can calculate a log BCF in fish of 2.16 indicating that ethylbenzene should not significantly bioconcentrate in aquatic organisms. Ethylbenzene has a moderate adsorption for soil. The measured Koc for silt loam was 164

**Physical:** The predominant photochemical reaction of ethylbenzene in the atmosphere is with hydroxyl radicals; the tropospheric half-life for this reaction is 5.5 and 24 hr in the summer and winter, actively. Degradation is somewhat faster under photochemical smog situations. Photooxidation products which have been identified include ethylphenol, benzaldehyde, acetophenone and m- and p-ethylnitrobenzene. Ethylbenzene is resistant to hydrolysis. Ethylbenzene does not significantly absorb light above 290 nm in methanol solution.

**Other:** 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:** None listed.

## Section 14 - Transport Information

	US DOT	Canada TDG
<b>Shipping Name:</b>	ETHYLBENZENE	ETHYLBENZENE
<b>Hazard Class:</b>	3	3
<b>UN Number:</b>	UN1175	UN1175
<b>Packing Group:</b>	II	II
<b>Additional Info:</b>		FLASHPOINT 15 C

## Section 15 - Regulatory Information

## US FEDERAL

### TSCA

CAS# 100-41-4 is listed on the TSCA inventory.

### Health & Safety Reporting List

CAS# 100-41-4: Effective 6/19/87, Sunset 6/19/97

### 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# 100-41-4: 1000 lb final RQ; 454 kg final RQ

### SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

### SARA Codes

CAS # 100-41-4: immediate, delayed, fire.

### Section 313

This material contains Ethylbenzene (CAS# 100-41-4, >99%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

### Clean Air Act:

CAS# 100-41-4 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# 100-41-4 is listed as a Hazardous Substance under the CWA. CAS# 100-41-4 is listed as a Priority Pollutant under the Clean Water Act. CAS# 100-41-4 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

CAS# 100-41-4 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 Ethylbenzene, a chemical known to the state of California to cause cancer. 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 11 Highly flammable.

R 20 Harmful by inhalation.

#### Safety Phrases:

S 16 Keep away from sources of ignition - No smoking.

S 24/25 Avoid contact with skin and eyes.

S 29 Do not empty into drains.

### WGK (Water Danger/Protection)

CAS# 100-41-4: 1

### Canada - DSL/NDSL

CAS# 100-41-4 is listed on Canada's DSL List.

### Canada - WHMIS

This product has a WHMIS classification of B2, D2B, 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# 100-41-4 is listed on the Canadian Ingredient Disclosure List.

<b>Section 16 - Additional Information</b>
--------------------------------------------

**MSDS Creation Date:** 4/28/1999

**Revision #6 Date:** 11/29/2007

*The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.*



Material Safety Data Sheet

Fluoranthene, 93%

MSDS# 01667

Section 1 - Chemical Product and Company Identification

MSDS Name: Fluoranthene, 93%  
Catalog Numbers: AC345980000, AC345980010, AC345982500  
Synonyms:

Company Identification: Acros Organics BVBA  
Janssen Pharmaceuticaaan 3a  
2440 Geel, Belgium  
Acros Organics  
One Reagent Lane  
Fair Lawn, NJ 07410  
Company Identification: (USA)  
For information in the US, call: 800-ACROS-01  
For information in Europe, call: +32 14 57 52 11  
Emergency Number, Europe: +32 14 57 52 99  
Emergency Number US: 201-796-7100  
CHEMTREC Phone Number, US: 800-424-9300  
CHEMTREC Phone Number, Europe: 703-527-3887

Section 2 - Composition, Information on Ingredients

-----  
CAS#: 206-44-0  
Chemical Name: Fluoranthene  
%: 93%  
EINECS#: 205-912-4  
-----

Hazard Symbols: XN



Risk Phrases: 22

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Not available Target Organs: None known.

Potential Health Effects

Eye: May cause eye irritation.  
Skin: May cause skin irritation.  
Ingestion: Harmful if swallowed. May cause irritation of the digestive tract.  
Inhalation: May cause respiratory tract irritation.  
Chronic:

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.

Ingestion: Get medical aid. Wash mouth out with water.

Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician:

### Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear.

Extinguishing Media: In case of fire, use water, dry chemical, chemical foam, or alcohol-resistant foam.

Autoignition Temperature: Not available

Flash Point: > 100 deg C (> 212.00 deg F)

Explosion Limits: Lower: Not available

Explosion Limits: Upper: Not available

NFPA Rating: Not published

### 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.

### Section 7 - Handling and Storage

Handling: Avoid breathing dust, mist, or vapor. Avoid contact with skin and eyes.

Storage: Store in a cool, dry place. Store in a tightly closed container.

### Section 8 - Exposure Controls, Personal Protection

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Fluoranthene	none listed	none listed	none listed

OSHA Vacated PELs: Fluoranthene: None listed

Engineering Controls:

Use adequate ventilation to keep airborne concentrations low.

Exposure Limits

Personal Protective Equipment

Eyes: Not available

Skin: Wear appropriate protective gloves and clothing to prevent skin exposure.

Clothing: Wear appropriate protective clothing to minimize contact with skin.

Respirators: Wear a NIOSH/MSHA or European Standard EN 149 approved full-facepiece airline respirator in the positive pressure mode with emergency escape provisions.

### Section 9 - Physical and Chemical Properties

Physical State: Crystalline powder

Color: yellow

Odor: odorless

pH: Not available

Vapor Pressure: Not available

Vapor Density: Not available

Evaporation Rate: Not available

Viscosity: Not available

Boiling Point: 380 - 34.0 deg C @

Freezing/Melting Point: 109.00 - 111

Decomposition Temperature: Not available

Solubility in water: insoluble

Specific Gravity/Density:

Molecular Formula: C16H10

Molecular Weight: 202.07

#### Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.

Conditions to Avoid: Incompatible materials.

Incompatibilities with Other Materials: Not available

Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.

Hazardous Polymerization: Has not been reported.

#### Section 11 - Toxicological Information

RTECS#: CAS# 206-44-0: LL4025000

RTECS:

LD50/LC50: CAS# **206-44-0**: Oral, rat: LD50 = 2 gm/kg;  
Skin, rabbit: LD50 = 3180 mg/kg;

Carcinogenicity: Fluoranthene - IARC: Group 3 (not classifiable)

Other: The toxicological properties have not been fully investigated. See actual entry in RTECS for complete information.

#### Section 12 - Ecological Information

Other: No information 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: Please contact Fisher Scientific for shipping information

Hazard Class:

UN Number:

Packing Group:

Canada TDG

Shipping Name: Not available

Hazard Class:

UN Number:

Packing Group:

USA RQ: CAS# 206-44-0: 100 lb final RQ; 45.4 kg final RQ

#### Section 15 - Regulatory Information

##### European/International Regulations

###### European Labeling in Accordance with EC Directives

Hazard Symbols: XN

Risk Phrases:

R 22 Harmful if swallowed.

Safety Phrases:

###### WGK (Water Danger/Protection)

CAS# 206-44-0: Not available

##### Canada

CAS# 206-44-0 is listed on Canada's NDSL List



Canadian WHMIS Classifications: Not available

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# 206-44-0 is listed on Canada's Ingredient Disclosure List

US Federal

TSCA

CAS# 206-44-0 is listed on the TSCA Inventory.

Section 16 - Other Information

MSDS Creation Date: 10/27/1999

Revision #5 Date 7/20/2009

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential, or exemplary damages howsoever arising, even if the company has been advised of the possibility of such damages.

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# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 01.23.2015

Page 1 of 7

## Iron Powder

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

**Product name :** Iron Powder

**Manufacturer/Supplier Trade name:**

**Manufacturer/Supplier Article number:** S25370A

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

**Manufacturer Details:**

AquaPhoenix Scientific  
9 Barnhart Drive, Hanover, PA 17331

**Supplier Details:**

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

**Emergency telephone number:**

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

### SECTION 2 : Hazards identification

**Classification of the substance or mixture:**



**Flammable**

Flammable solids, category 1  
Self-heating substances and mixtures, category 1

Flam. Sol. 1

Self-heat. 1

Hazards Not Otherwise Classified - Combustible Dust

**Signal word :** Danger

**Hazard statements:**

Flammable solid

Self-heating; may catch fire

**Precautionary statements:**

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

Keep out of reach of children

Read label before use

Keep away from heat/sparks/open flames/hot surfaces. No smoking

Ground/bond container and receiving equipment

Use explosion-proof electrical/ventilating/light/equipment

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

Do not eat, drink or smoke when using this product

**Combustible Dust Hazard :**

May form combustible dust concentrations in air (during processing).

**Other Non-GHS Classification:**

**WHMIS**

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 01.23.2015

Page 2 of 7

## Iron Powder



### NFPA/HMIS



NFPA SCALE (0-4)

Health	2
Flammability	1
Physical Hazard	1
Personal Protection	X

HMIS RATINGS (0-4)

### SECTION 3 : Composition/information on ingredients

#### Ingredients:

CAS 7439-89-6

Iron

>97 %

Percentages are by weight

### SECTION 4 : First aid measures

#### Description of first aid measures

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

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

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

**After swallowing:** Rinse mouth thoroughly. Do not induce vomiting. Have exposed individual drink sips of water. Seek medical attention if irritation, discomfort or vomiting persists.

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

Irritation, Nausea, Headache, Shortness of breath.;

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

If seeking medical attention, provide SDS document to physician.

### SECTION 5 : Firefighting measures

#### Extinguishing media

**Suitable extinguishing agents:** If in laboratory setting, follow laboratory fire suppression procedures. Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition

**For safety reasons unsuitable extinguishing agents:**

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

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 01.23.2015

Page 3 of 7

## Iron Powder

Combustion products may include carbon oxides or other toxic vapors. Thermal decomposition can lead to release of irritating gases and vapors. Avoid generating dust; fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.

### Advice for firefighters:

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

**Additional information (precautions):** Move product containers away from fire or keep cool with water spray as a protective measure, where feasible. Use spark-proof tools and explosion-proof equipment.

## SECTION 6 : Accidental release measures

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

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

### Environmental precautions:

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

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

If in a laboratory setting, follow Chemical Hygiene Plan procedures. Place into properly labeled containers for recovery or disposal. If necessary, use trained response staff/contractor. Dust deposits should not be allowed to accumulate on surfaces, as these may form an explosive mixture if they are released into the atmosphere in sufficient concentration. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). Collect solids in powder form using vacuum with (HEPA filter)

### Reference to other sections:

## SECTION 7 : Handling and storage

### Precautions for safe handling:

Minimize dust generation and accumulation. Wash hands after handling. Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces. Dry powders can build static electricity charges when subjected to the friction of transfer and mixing operations. Follow good hygiene procedures when handling chemical materials. Use only in well ventilated areas. Avoid contact with eyes, skin, and clothing.

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

Provide ventilation for containers. Avoid storage near extreme heat, ignition sources or open flame. Store away from foodstuffs. Store away from oxidizing agents. Store in cool, dry conditions in well sealed containers. Store with like hazards

## SECTION 8 : Exposure controls/personal protection



### Control Parameters:

, , OSHA PEL TWA (Total Dust) 15 mg/m<sup>3</sup> (50 mppcf\*)  
, , ACGIH TLV TWA (inhalable particles) 10 mg/m<sup>3</sup>

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 01.23.2015

Page 4 of 7

## Iron Powder

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

**Respiratory protection:** Not required under normal conditions of use. Use suitable respiratory protective device when high concentrations are present. Use suitable respiratory protective device when aerosol or mist is formed. For spills, respiratory protection may be advisable.

**Protection of skin:** The glove material has to be impermeable and resistant to the product/ the substance/ the preparation being used/handled. Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation.

**Eye protection:** Safety glasses with side shields or goggles.

**General hygienic measures:** The usual precautionary measures are to be adhered to when handling chemicals. Immediately remove all soiled and contaminated clothing. Wash hands before breaks and at the end of work. Do not inhale gases/fumes/dust/mist/vapor/aerosols. Avoid contact with the eyes and skin.

## SECTION 9 : Physical and chemical properties

<b>Appearance (physical state,color):</b>	Black to gray solid	<b>Explosion limit lower: Explosion limit upper:</b>	Not Determined Not Determined
<b>Odor:</b>	Odorless	<b>Vapor pressure:</b>	1 mm Hg @ 1787C
<b>Odor threshold:</b>	Not Determined	<b>Vapor density:</b>	Not Determined
<b>pH-value:</b>	Not Determined	<b>Relative density:</b>	7.86 @ 20C
<b>Melting/Freezing point:</b>	1535C	<b>Solubilities:</b>	Insoluble in water.
<b>Boiling point/Boiling range:</b>	2750C	<b>Partition coefficient (n-octanol/water):</b>	Not Determined
<b>Flash point (closed cup):</b>	Not Determined	<b>Auto/Self-ignition temperature:</b>	Not Determined
<b>Evaporation rate:</b>	Not Determined	<b>Decomposition temperature:</b>	Not Determined
<b>Flammability (solid,gaseous):</b>	Not Determined	<b>Viscosity:</b>	a. Kinematic: Not Determined b. Dynamic: Not Determined
<b>Density:</b> Not Determined <b>Iron:</b> Molecular Weight: 55.847			

## SECTION 10 : Stability and reactivity

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 01.23.2015

Page 5 of 7

## Iron Powder

### Reactivity:

**Chemical stability:**Decomposes when heated. Oxidizes when exposed to air.

### Possible hazardous reactions:

**Conditions to avoid:**Store away from oxidizing agents, strong acids or bases.Incompatible materials, moisture, exposure to air, excess heat.

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

**Hazardous decomposition products:**Oxides of iron

## SECTION 11 : Toxicological information

### Acute Toxicity:

Oral:	30 mg/kg	LD50 orl - rat
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**Chronic Toxicity:** No additional information.

**Corrosion Irritation:** No additional information.

**Sensitization:** No additional information.

**Single Target Organ (STOT):** No additional information.

**Numerical Measures:** No additional information.

**Carcinogenicity:** No additional information.

**Mutagenicity:** No additional information.

**Reproductive Toxicity:** No additional information.

## SECTION 12 : Ecological information

**Ecotoxicity Persistence and degradability:** Readily degradable in the environment.

**Bioaccumulative potential:**

**Mobility in soil:**

**Other adverse effects:**

## SECTION 13 : Disposal considerations

### Waste disposal recommendations:

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

## SECTION 14 : Transport information

### UN-Number

3089

### UN proper shipping name

METAL POWDERS, FLAMM ABLE, N.O.S.

### Transport hazard class(es)

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 01.23.2015

Page 6 of 7

## Iron Powder



**Class:**

4.1 Flammable solids, self-reactive substances and solid desensitized explosives

**Packing group:**II

**Environmental hazard:**

**Transport in bulk:**

**Special precautions for user:**

### SECTION 15 : Regulatory information

#### United States (USA)

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

None of the ingredients is listed

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

None of the ingredients is listed

**RCRA (hazardous waste code):**

None of the ingredients is listed

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

All ingredients are listed.

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

None of the ingredients is listed

#### Proposition 65 (California):

**Chemicals known to cause cancer:**

None of the ingredients is listed

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

None of the ingredients is listed

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

None of the ingredients is listed

**Chemicals known to cause developmental toxicity:**

None of the ingredients is listed

#### Canada

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

All ingredients are listed.

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

None of the ingredients is listed

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

None of the ingredients is listed

### SECTION 16 : Other information

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations. Note: The responsibility to provide a safe workplace remains with the user. The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct

## Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

**Effective date** : 01.23.2015

Page 7 of 7

### Iron Powder

employees and develop work practice procedures for a safe work environment. The information contained herein is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material. It is the responsibility of the user to comply with all applicable laws and regulations applicable to this material.

#### **GHS Full Text Phrases:**

#### **Abbreviations and acronyms:**

IMDG: International Maritime Code for Dangerous Goods

PNEC: Predicted No-Effect Concentration (REACH)

CFR: Code of Federal Regulations (USA)

SARA: Superfund Amendments and Reauthorization Act (USA)

RCRA: Resource Conservation and Recovery Act (USA)

TSCA: Toxic Substances Control Act (USA)

NPRI: National Pollutant Release Inventory (Canada)

DOT: US Department of Transportation

IATA: International Air Transport Association

GHS: Globally Harmonized System of Classification and Labelling of Chemicals

ACGIH: American Conference of Governmental Industrial Hygienists

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

NFPA: National Fire Protection Association (USA)

HMIS: Hazardous Materials Identification System (USA)

WHMIS: Workplace Hazardous Materials Information System (Canada)

DNEL: Derived No-Effect Level (REACH)

**Effective date** : 01.23.2015

**Last updated** : 03.19.2015



## SAFETY DATA SHEET

Creation Date 16-Apr-2012

Revision Date 19-Jan-2018

Revision Number 3

### 1. Identification

**Product Name** Cumene

**Cat No. :** AC329730000; AC329730025; AC329730050; AC329735000

**CAS-No** 98-82-8  
**Synonyms** Isopropylbenzene

**Recommended Use** Laboratory chemicals.  
**Uses advised against** Food, drug, pesticide or biocidal product use.  
**Details of the supplier of the safety data sheet**

**Company**

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

**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
Acute oral toxicity	Category 4
Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Carcinogenicity	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

Harmful if swallowed  
 Causes skin irritation  
 Causes eye irritation  
 Suspected of causing cancer  
 May cause respiratory irritation  
 May be fatal if swallowed and enters airways



### 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  
 Wear protective gloves/protective clothing/eye protection/face protection  
 Wash face, hands and any exposed skin thoroughly after handling  
 Do not eat, drink or smoke when using this product

#### Response

Call a POISON CENTER or doctor/physician if you feel unwell

#### Inhalation

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

#### Skin

Take off contaminated clothing and wash before reuse

IF ON SKIN: Wash with plenty of soap and water

If skin irritation occurs: Get medical advice/attention

#### Eyes

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

If eye irritation persists: Get medical advice/attention

#### Ingestion

Rinse mouth

Do NOT induce vomiting

IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician

#### Fire

Fight fire with normal precautions from a reasonable distance

Evacuate area

#### Storage

Store locked up

Store in a well-ventilated place. Keep container tightly closed

#### Disposal

Dispose of contents/container to an approved waste disposal plant

#### Hazards not otherwise classified (HNOC)

Toxic to aquatic life with long lasting effects

WARNING. Cancer - <https://www.p65warnings.ca.gov/>.

## 3. Composition/Information on Ingredients

Component	CAS-No	Weight %
-----------	--------	----------

Cumene	98-82-8	>95
--------	---------	-----

#### 4. First-aid measures

<b>General Advice</b>	If symptoms persist, call a physician.
<b>Eye Contact</b>	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.
<b>Skin Contact</b>	Wash off immediately with plenty of water for at least 15 minutes. Get medical attention.
<b>Inhalation</b>	Remove to fresh air. Get medical attention. If not breathing, give artificial respiration. Risk of serious damage to the lungs (by aspiration).
<b>Ingestion</b>	Do NOT induce vomiting. Get medical attention. Call a physician or poison control center immediately. If vomiting occurs naturally, have victim lean forward.
<b>Most important symptoms and effects</b>	Difficulty in breathing. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting
<b>Notes to Physician</b>	Treat symptomatically

#### 5. Fire-fighting measures

<b>Suitable Extinguishing Media</b>	Water spray, carbon dioxide (CO <sub>2</sub> ), dry chemical, alcohol-resistant foam. Water mist may be used to cool closed containers.
<b>Unsuitable Extinguishing Media</b>	Do not use a solid water stream as it may scatter and spread fire
<b>Flash Point</b>	31 °C / 87 °F
<b>Method -</b>	No information available
<b>Autoignition Temperature</b>	424 °C / 795 °F
<b>Explosion Limits</b>	
<b>Upper</b>	No data available
<b>Lower</b>	No data available
<b>Sensitivity to Mechanical Impact</b>	No information available
<b>Sensitivity to Static Discharge</b>	No information available

#### Specific Hazards Arising from the Chemical

Flammable. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Containers may explode when heated. Vapors may form explosive mixtures with air.

#### Hazardous Combustion Products

Carbon monoxide (CO). Carbon dioxide (CO<sub>2</sub>).

#### 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**  
3

**Flammability**  
2

**Instability**  
0

**Physical hazards**  
N/A

#### 6. Accidental release measures

<b>Personal Precautions</b>	Use personal protective equipment as required. Ensure adequate ventilation. Remove all sources of ignition. Take precautionary measures against static discharges.
<b>Environmental Precautions</b>	Do not flush into surface water or sanitary sewer system.

**Methods for Containment and Clean Up** Keep in suitable, closed containers for disposal. Soak up with inert absorbent material. 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/face protection. Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. Take precautionary measures against static discharges. Use spark-proof tools and explosion-proof equipment.

**Storage** Keep container tightly closed in a dry and well-ventilated place. Keep away from heat, sparks and flame. Flammables area.

## 8. Exposure controls / personal protection

### Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Cumene	TWA: 50 ppm	(Vacated) TWA: 50 ppm (Vacated) TWA: 245 mg/m <sup>3</sup> Skin TWA: 50 ppm TWA: 245 mg/m <sup>3</sup>	IDLH: 900 ppm TWA: 50 ppm TWA: 245 mg/m <sup>3</sup>	TWA: 50 ppm

### Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

**Engineering Measures** Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting/equipment.

### Personal Protective Equipment

**Eye/face Protection** Tight sealing safety goggles. Face protection shield.

**Skin and body protection** Wear appropriate protective gloves and clothing to prevent skin exposure.

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

**Hygiene Measures** Handle in accordance with good industrial hygiene and safety practice.

## 9. Physical and chemical properties

<b>Physical State</b>	Liquid
<b>Appearance</b>	Colorless
<b>Odor</b>	No information available
<b>Odor Threshold</b>	No information available
<b>pH</b>	No information available
<b>Melting Point/Range</b>	-96 °C / -141 °F
<b>Boiling Point/Range</b>	152 - 154 °C / 306 - 309 °F
<b>Flash Point</b>	31 °C / 87 °F
<b>Evaporation Rate</b>	No information available
<b>Flammability (solid,gas)</b>	Not applicable

**Flammability or explosive limits**

Upper	No data available
Lower	No data available
Vapor Pressure	5.3 hPa @ 20 °C
Vapor Density	No information available
Specific Gravity	0.862
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	424 °C / 795 °F
Decomposition Temperature	No information available
Viscosity	0.79 mPa.s at 20 °C
Molecular Formula	C9 H12
Molecular Weight	120.19

## 10. Stability and reactivity

<b>Reactive Hazard</b>	None known, based on information available
<b>Stability</b>	Stable under normal conditions.
<b>Conditions to Avoid</b>	Excess heat. Incompatible products. Keep away from open flames, hot surfaces and sources of ignition.
<b>Incompatible Materials</b>	Strong oxidizing agents
<b>Hazardous Decomposition Products</b>	Carbon monoxide (CO), Carbon dioxide (CO <sub>2</sub> )
<b>Hazardous Polymerization</b>	Hazardous polymerization does not occur.
<b>Hazardous Reactions</b>	None under normal processing.

## 11. Toxicological information

**Acute Toxicity****Product Information****Component Information**

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Cumene	1400 mg/kg ( Rat ) 2700 mg/kg ( Rat )	LD50 = 12300 µL/kg ( Rabbit )	LC50 > 3577 ppm ( Rat ) 6 h LC50 = 39000 mg/m <sup>3</sup> ( Rat ) 4 h

**Toxicologically Synergistic Products** No information available

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

<b>Irritation</b>	Irritating to eyes, respiratory system and skin
<b>Sensitization</b>	No information available
<b>Carcinogenicity</b>	The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Cumene	98-82-8	Group 2B	Reasonably Anticipated	Not listed	X	Not listed

*IARC (International Agency for Research on Cancer)*

*IARC (International Agency for Research on Cancer)*  
 Group 1 - Carcinogenic to Humans  
 Group 2A - Probably Carcinogenic to Humans  
 Group 2B - Possibly Carcinogenic to Humans

<b>Mutagenic Effects</b>	No information available
<b>Reproductive Effects</b>	No information available.

<b>Developmental Effects</b>	No information available.
<b>Teratogenicity</b>	No information available.
<b>STOT - single exposure</b>	Respiratory system
<b>STOT - repeated exposure</b>	None known
<b>Aspiration hazard</b>	Category 1
<b>Symptoms / effects, both acute and delayed</b>	Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting
<b>Endocrine Disruptor Information</b>	No information available
<b>Other Adverse Effects</b>	The toxicological properties have not been fully investigated.

## 12. Ecological information

### Ecotoxicity

The product contains following substances which are hazardous for the environment. Contains a substance which is: Very toxic to aquatic organisms.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Cumene	EC50: = 2.6 mg/L, 72h (Pseudokirchneriella subcapitata)	LC50: = 2.7 mg/L, 96h semi-static (Oncorhynchus mykiss) LC50: = 4.8 mg/L, 96h flow-through (Oncorhynchus mykiss) LC50: 6.04 - 6.61 mg/L, 96h flow-through (Pimephales promelas) LC50: = 5.1 mg/L, 96h semi-static (Poecilia reticulata)	EC50 = 0.89 mg/L 5 min EC50 = 1.10 mg/L 15 min EC50 = 1.48 mg/L 30 min EC50 = 172 mg/L 24 h	EC50: 7.9 - 14.1 mg/L, 48h Static (Daphnia magna) EC50: = 0.6 mg/L, 48h (Daphnia magna)

<b>Persistence and Degradability</b>	Persistence is unlikely
<b>Bioaccumulation/ Accumulation</b>	No information available.
<b>Mobility</b>	. Is not likely mobile in the environment due its low water solubility.

Component	log Pow
Cumene	3.7

## 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
Cumene - 98-82-8	U055	-

## 14. Transport information

### DOT

<b>UN-No</b>	UN1918
<b>Proper Shipping Name</b>	ISOPROPYLBENZENE
<b>Hazard Class</b>	3
<b>Packing Group</b>	III

### TDG

UN-No UN1918  
 Proper Shipping Name ISOPROPYLBENZENE  
 Hazard Class 3  
 Packing Group III

**IATA**

UN-No UN1918  
 Proper Shipping Name ISOPROPYLBENZENE  
 Hazard Class 3  
 Packing Group III

**IMDG/IMO**

UN-No UN1918  
 Proper Shipping Name ISOPROPYLBENZENE  
 Hazard Class 3  
 Packing Group III

## 15. Regulatory information

**United States of America Inventory**

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
Cumene	98-82-8	X	ACTIVE	-

**Legend:**

TSCA - Toxic Substances Control Act, (40 CFR Part 710)

X - Listed

- - Not Listed

TSCA 12(b) - Notices of Export Not applicable

**International Inventories**

Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
Cumene	98-82-8	X	-	202-704-5	X	X	X	X	KE-23957

**U.S. Federal Regulations****SARA 313**

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Cumene	98-82-8	>95	1.0

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act) Not applicable

**Clean Air Act**

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Cumene	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
Cumene	5000 lb	-

**California Proposition 65** This product contains the following Proposition 65 chemicals.

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Cumene	98-82-8	Carcinogen	-	Carcinogen

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

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Cumene	X	X	X	X	X

**U.S. Department of Transportation**

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

**U.S. Department of Homeland Security** This product does not contain any DHS chemicals.

**Other International Regulations**

**Mexico - Grade** Serious risk, Grade 3

## 16. Other information

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

**Creation Date** 16-Apr-2012

**Revision Date** 19-Jan-2018

**Print Date** 19-Jan-2018

**Revision Summary** This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

**Disclaimer**

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

**End of SDS**



# Material Safety Data Sheet

## Magnesium, turnings and ribbons

ACC# 13290

### Section 1 - Chemical Product and Company Identification

**MSDS Name:** Magnesium, turnings and ribbons**Catalog Numbers:** AC191080000, AC191080025, AC191085000, S72223D, S72233D, S75532, S75551, S755511, S755512, M11-500, M8-10Z, M8-212, NC9327500**Synonyms:** Magnesium metal (ribbons/turnings)**Company Identification:**Fisher Scientific  
1 Reagent Lane  
Fair Lawn, NJ 07410**For information, call:** 201-796-7100**Emergency Number:** 201-796-7100**For CHEMTREC assistance, call:** 800-424-9300**For International CHEMTREC assistance, call:** 703-527-3887

### Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7439-95-4	Magnesium	>99	231-104-6

### Section 3 - Hazards Identification

#### EMERGENCY OVERVIEW

Appearance: silver white solid.

**Warning!** Flammable solid. Water-reactive. Contact with water liberates extremely flammable gases. May cause eye and skin irritation. May cause respiratory tract irritation. Inhalation of fumes may cause metal-fume fever. Air sensitive.**Target Organs:** None.**Potential Health Effects****Eye:** Dust may cause mechanical irritation.**Skin:** Dust may cause mechanical irritation. May be harmful if absorbed through the skin. Particles embedded in the skin may cause "chemical gas gangrene" with symptoms of persistent lesions, inflammation and gas bubbles under the skin.**Ingestion:** May cause irritation of the digestive tract. Low hazard for usual industrial handling.**Inhalation:** May cause respiratory tract irritation. Inhalation of fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain and increased white blood cell count. May 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.

**Skin:** Get medical aid. 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 cupfuls of milk or water. Get medical aid immediately.

**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:** The use of calcium gluconate as antidotal treatment for magnesium over dose should be determined only by qualified medical personnel (Medical Toxicology, 1988).

**Antidote:** The use of Dimercaprol or BAL (British Anti-Lewisite) as a chelating agent should be determined by qualified medical personnel.

## 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. Water reactive. Material will react with water and may release a flammable and/or toxic gas. This material in sufficient quantity and reduced particle size is capable of creating a dust explosion. Flammable solid. May react with acids or moisture to form explosive hydrogen gas.

**Extinguishing Media:** Use approved class D extinguishing agents or smother with dry sand, clay, or sodium bicarbonate. Do NOT use water, carbon dioxide, or foam.

**Flash Point:** Not applicable.

**Autoignition Temperature:** 472.8 deg C ( 883.04 deg F)

**Explosion Limits, Lower:**Not available.

**Upper:** Not available.

**NFPA Rating:** (estimated) Health: 0; Flammability: 1; Instability: 1

## Section 6 - Accidental Release Measures

**General Information:** Use proper personal protective equipment as indicated in Section 8.

**Spills/Leaks:** Scoop up with a nonsparking tool, then place into a suitable container for disposal. Avoid generating dusty conditions. Remove all sources of ignition. Place under an inert atmosphere.

## Section 7 - Handling and Storage

**Handling:** Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. 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. Avoid ingestion and inhalation. Store protected from air. 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. Water free area.

## 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
Magnesium	none listed	none listed	none listed

**OSHA Vacated PELs:** Magnesium: No OSHA Vacated PELs are listed for this chemical.

**Personal Protective Equipment**

**Eyes:** Wear chemical splash goggles and face shield.

**Skin:** Wear impervious gloves.

**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

**Appearance:** silver white

**Odor:** none reported

**pH:** >7 (water solution)

**Vapor Pressure:** Negligible.

**Vapor Density:** Negligible.

**Evaporation Rate:** Negligible.

**Viscosity:** Not available.

**Boiling Point:** 1107.2 deg C

**Freezing/Melting Point:** 650 deg C

**Decomposition Temperature:** Not available.

**Solubility:** Insoluble in water.

**Specific Gravity/Density:** 1.74

**Molecular Formula:** Mg

**Molecular Weight:** 24.3

## Section 10 - Stability and Reactivity

**Chemical Stability:** Stable under normal temperatures and pressures. Air sensitive. Reacts with water.

**Conditions to Avoid:** Ignition sources, exposure to air, contact with water.

**Incompatibilities with Other Materials:** Strong oxidizing agents, acids, acid chlorides, chlorinated solvents, halogens.

**Hazardous Decomposition Products:** Oxides of magnesium.

**Hazardous Polymerization:** Has not been reported.

## Section 11 - Toxicological Information

**RTECS#:**

**CAS#** 7439-95-4: FW6475100

**LD50/LC50:**

Not available.

**Carcinogenicity:**

CAS# 7439-95-4: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

**Epidemiology:** No data available.

**Teratogenicity:** No data available.

**Reproductive Effects:** No data available.

**Mutagenicity:** No data available.

**Neurotoxicity:** No data available.

**Other Studies:**

## Section 12 - Ecological Information

**Ecotoxicity:** No data available. No information available.

**Environmental:** No information available.

**Physical:** No information available.

**Other:** None.

## 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:** None listed.

## Section 14 - Transport Information

	US DOT	Canada TDG
<b>Shipping Name:</b>	MAGNESIUM	MAGNESIUM
<b>Hazard Class:</b>	4.1	4.1
<b>UN Number:</b>	UN1869	UN1869
<b>Packing Group:</b>	III	III

## Section 15 - Regulatory Information

### US FEDERAL

#### TSCA

CAS# 7439-95-4 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

None of the chemicals in this material have an RQ.

#### SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

#### SARA Codes

CAS # 7439-95-4: immediate, fire, reactive.

**Section 313** No chemicals are reportable under Section 313.

#### 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.

None of the chemicals in this product are listed as Priority Pollutants under the CWA.

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# 7439-95-4 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Massachusetts.

**California Prop 65**

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:**

F

**Risk Phrases:**

R 11 Highly flammable.

R 15 Contact with water liberates extremely flammable gases.

**Safety Phrases:**

S 7/8 Keep container tightly closed and dry.

S 43A In case of fire, use dry chemical (never use water).

**WGK (Water Danger/Protection)**

CAS# 7439-95-4: No information available.

**Canada - DSL/NDSL**

CAS# 7439-95-4 is listed on Canada's DSL List.

**Canada - WHMIS**

This product has a WHMIS classification of B4.

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**

<b>Section 16 - Additional Information</b>
--------------------------------------------

**MSDS Creation Date:** 12/12/1997

**Revision #7 Date:** 11/05/2007

*The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.*

## SAFETY DATA SHEET

Creation Date 24-Nov-2010

Revision Date 19-Jan-2018

Revision Number 3

### 1. Identification

**Product Name** Manganese, powder, -325 mesh

**Cat No. :** AC317440000; AC317440010; AC317442500

**CAS-No** 7439-96-5  
**Synonyms** No information available

**Recommended Use** Laboratory chemicals.  
**Uses advised against** Food, drug, pesticide or biocidal product use.  
**Details of the supplier of the safety data sheet**

**Company**

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

**Emergency Telephone Number**

For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11

Emergency Number **US**:001-201-796-7100 / **Europe**: +32 14 57 52 99

**CHEMTREC** Tel. No.**US**:001-800-424-9300 / **Europe**:001-703-527-3887

### 2. Hazard(s) identification

**Classification**

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

Flammable solids	Category 2
Serious Eye Damage/Eye Irritation	Category 2

**Label Elements**

**Signal Word**

Warning

**Hazard Statements**

Flammable solid  
Causes serious eye irritation

**Precautionary Statements****Prevention**

Wash face, hands and any exposed skin thoroughly after handling  
 Keep away from heat/sparks/open flames/hot surfaces. - No smoking  
 Ground/bond container and receiving equipment  
 Use explosion-proof electrical/ventilating/lighting/equipment  
 Wear protective gloves/protective clothing/eye protection/face protection

**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 CO<sub>2</sub>, dry chemical, or foam for extinction

**Hazards not otherwise classified (HNOC)**

None identified

### 3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Manganese	7439-96-5	>95

### 4. First-aid measures

<b>Eye Contact</b>	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.
<b>Skin Contact</b>	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention.
<b>Inhalation</b>	Remove from exposure, lie down. Remove to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention.
<b>Ingestion</b>	Clean mouth with water. Get medical attention.
<b>Most important symptoms and effects</b>	No information available.
<b>Notes to Physician</b>	Treat symptomatically

### 5. Fire-fighting measures

<b>Suitable Extinguishing Media</b>	Dry chemical.
<b>Unsuitable Extinguishing Media</b>	No information available
<b>Flash Point</b>	No information available
<b>Method -</b>	No information available
<b>Autoignition Temperature</b>	No information available
<b>Explosion Limits</b>	No information available

<b>Upper</b>	No data available
<b>Lower</b>	No data available
<b>Sensitivity to Mechanical Impact</b>	No information available
<b>Sensitivity to Static Discharge</b>	No information available

**Specific Hazards Arising from the Chemical**

Combustible material.

**Hazardous Combustion Products**

None known.

**Protective Equipment and Precautions for Firefighters**

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

**NFPA**

<b>Health</b>	<b>Flammability</b>	<b>Instability</b>	<b>Physical hazards</b>
2	2	0	N/A

**6. Accidental release measures**

<b>Personal Precautions</b>	Ensure adequate ventilation. Use personal protective equipment as required.
<b>Environmental Precautions</b>	See Section 12 for additional Ecological Information.

<b>Methods for Containment and Clean Up</b>	Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment. Sweep up and shovel into suitable containers for disposal.
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**7. Handling and storage**

<b>Handling</b>	Avoid contact with skin and eyes. Do not breathe dust. Use spark-proof tools and explosion-proof equipment. Use only non-sparking tools.
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<b>Storage</b>	Keep in a dry, cool and well-ventilated place. Refer product specification and/or product label for specific storage temperature requirement. Keep container tightly closed. Keep away from heat, sparks and flame. Keep under nitrogen.
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**8. Exposure controls / personal protection****Exposure Guidelines**

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Manganese	TWA: 0.02 mg/m <sup>3</sup> TWA: 0.1 mg/m <sup>3</sup>	(Vacated) TWA: 1 mg/m <sup>3</sup> Ceiling: 5 mg/m <sup>3</sup> (Vacated) STEL: 3 mg/m <sup>3</sup> (Vacated) Ceiling: 5 mg/m <sup>3</sup>	IDLH: 500 mg/m <sup>3</sup> TWA: 1 mg/m <sup>3</sup> STEL: 3 mg/m <sup>3</sup>	TWA: 0.2 mg/m <sup>3</sup> TWA: 1 mg/m <sup>3</sup>

**Legend**

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

<b>Engineering Measures</b>	Ensure adequate ventilation, especially in confined areas.
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**Personal Protective Equipment**

<b>Eye/face Protection</b>	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
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<b>Skin and body protection</b>	Wear appropriate protective gloves and clothing to prevent skin exposure.
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<b>Respiratory Protection</b>	No protective equipment is needed under normal use conditions.
<b>Hygiene Measures</b>	Handle in accordance with good industrial hygiene and safety practice.

## 9. Physical and chemical properties

<b>Physical State</b>	Powder Solid
<b>Appearance</b>	Dark brown
<b>Odor</b>	No information available
<b>Odor Threshold</b>	No information available
<b>pH</b>	No information available
<b>Melting Point/Range</b>	1260 °C / 2300 °F
<b>Boiling Point/Range</b>	1900 °C / 3452 °F
<b>Flash Point</b>	No information available
<b>Evaporation Rate</b>	Not applicable
<b>Flammability (solid,gas)</b>	No information available
<b>Flammability or explosive limits</b>	
<b>Upper</b>	No data available
<b>Lower</b>	No data available
<b>Vapor Pressure</b>	No information available
<b>Vapor Density</b>	Not applicable
<b>Specific Gravity</b>	No information available
<b>Solubility</b>	No information available
<b>Partition coefficient; n-octanol/water</b>	No data available
<b>Autoignition Temperature</b>	No information available
<b>Decomposition Temperature</b>	No information available
<b>Viscosity</b>	Not applicable
<b>Molecular Formula</b>	Mn
<b>Molecular Weight</b>	54.94

## 10. Stability and reactivity

<b>Reactive Hazard</b>	None known, based on information available
<b>Stability</b>	Moisture sensitive.
<b>Conditions to Avoid</b>	Incompatible products. Exposure to moisture.
<b>Incompatible Materials</b>	Acids, Bases, Halogens
<b>Hazardous Decomposition Products</b>	None under normal use conditions
<b>Hazardous Polymerization</b>	Hazardous polymerization does not occur.
<b>Hazardous Reactions</b>	None under normal processing.

## 11. Toxicological information

### Acute Toxicity

#### Product Information

#### Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Manganese	LD50 = 9 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
Manganese	7439-96-5	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. 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
Manganese	Not listed	LC50: > 3.6 mg/L, 96h semi-static (Oncorhynchus mykiss)	Not listed	Not listed

**Persistence and Degradability** Insoluble in water

**Bioaccumulation/ Accumulation** No information available.

**Mobility** Is not likely mobile in the environment due its low water solubility.

## 13. Disposal considerations

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

## 14. Transport information

### DOT

**UN-No** UN3089  
**Proper Shipping Name** Metal powder, flammable, n.o.s.  
**Technical Name** Manganese  
**Hazard Class** 4.1  
**Packing Group** III

### TDG

**UN-No** UN3089  
**Proper Shipping Name** Metal powder, flammable, n.o.s.  
**Hazard Class** 4.1  
**Packing Group** III

**IATA**

UN-No UN3089  
 Proper Shipping Name Metal powder, flammable, n.o.s.  
 Hazard Class 4.1  
 Packing Group III

**IMDG/IMO**

UN-No UN3089  
 Proper Shipping Name Metal powder, flammable, n.o.s.  
 Hazard Class 4.1  
 Packing Group III

**15. Regulatory information****United States of America Inventory**

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
Manganese	7439-96-5	X	ACTIVE	-

**Legend:**

TSCA - Toxic Substances Control Act, (40 CFR Part 710)

X - Listed

- - Not Listed

TSCA 12(b) - Notices of Export Not applicable

**International Inventories**

Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
Manganese	7439-96-5	X	-	231-105-1	X	X	X	X	KE-22999

**U.S. Federal Regulations****SARA 313**

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Manganese	7439-96-5	>95	1.0

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act) Not applicable

**Clean Air Act**

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Manganese	X		-

OSHA - Occupational Safety and Health Administration Not applicable

CERCLA Not applicable

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

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

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Manganese	X	X	X	X	X

**U.S. Department of Transportation**

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

**U.S. Department of Homeland Security** This product does not contain any DHS chemicals.

#### Other International Regulations

**Mexico - Grade** No information available

## 16. Other information

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

**Creation Date** 24-Nov-2010

**Revision Date** 19-Jan-2018

**Print Date** 19-Jan-2018

**Revision Summary** This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

#### **Disclaimer**

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

**End of SDS**

## SAFETY DATA SHEET

Revision Date 19-Jan-2018

Revision Number 3

### 1. Identification

**Product Name** Naphthalene-d8

**Cat No. :** AC174960000; AC174960010; AC174960050

**Synonyms** (2H8)Naphthalene

**Recommended Use** Laboratory chemicals.  
**Uses advised against** Food, drug, pesticide or biocidal product use.  
**Details of the supplier of the safety data sheet**

**Company**

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

Acros Organics  
One Reagent Lane  
Fair Lawn, NJ 07410

**Emergency Telephone Number**

For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11  
Emergency Number **US**:001-201-796-7100 / **Europe**: +32 14 57 52 99  
**CHEMTREC** Tel. No.**US**:001-800-424-9300 / **Europe**:001-703-527-3887

### 2. Hazard(s) identification

**Classification**

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

Acute oral toxicity	Category 4
Acute dermal toxicity	Category 4
Acute Inhalation Toxicity - Dusts and Mists	Category 4
Combustible dust	Yes

**Label Elements**

**Signal Word**

Warning

**Hazard Statements**

May form combustible dust concentrations in air  
Harmful if swallowed, in contact with skin or if inhaled



### 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  
 Call a POISON CENTER or doctor/physician if you feel unwell  
 Wash contaminated clothing before reuse

#### 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

#### 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 %
(2H8)Naphthalene	1146-65-2	100

### 4. First-aid measures

<b>Eye Contact</b>	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.
<b>Skin Contact</b>	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. In the case of skin irritation or allergic reactions see a physician.
<b>Inhalation</b>	Remove from exposure, lie down. Remove to fresh air. If symptoms persist, call a physician. If not breathing, give artificial respiration.
<b>Ingestion</b>	Never give anything by mouth to an unconscious person. Drink plenty of water. Call a physician immediately. If possible drink milk afterwards.
<b>Most important symptoms and effects</b>	No information available.
<b>Notes to Physician</b>	Treat symptomatically

### 5. Fire-fighting measures

<b>Suitable Extinguishing Media</b>	Water mist may be used to cool closed containers. Carbon dioxide (CO <sub>2</sub> ). Dry chemical.
<b>Unsuitable Extinguishing Media</b>	No information available
<b>Flash Point</b>	78 °C / 172.4 °F
<b>Method -</b>	No information available
<b>Autoignition Temperature</b>	526.1 °C / 979 °F
<b>Explosion Limits</b>	
<b>Upper</b>	5.9%
<b>Lower</b>	0.9%
<b>Sensitivity to Mechanical Impact</b>	No information available
<b>Sensitivity to Static Discharge</b>	No information available

**Specific Hazards Arising from the Chemical**

Flammable. Dust can form an explosive mixture with air. Combustible material. Fine dust dispersed in air may ignite. Combustible material. Containers may explode when heated.

**Hazardous Combustion Products**

Carbon monoxide (CO). Carbon dioxide (CO<sub>2</sub>).

**Protective Equipment and Precautions for Firefighters**

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

**NFPA**

<b>Health</b>	<b>Flammability</b>	<b>Instability</b>	<b>Physical hazards</b>
2	1	1	N/A

## 6. Accidental release measures

<b>Personal Precautions</b>	Remove all sources of ignition. Take precautionary measures against static discharges.
<b>Environmental Precautions</b>	See Section 12 for additional Ecological Information.

<b>Methods for Containment and Clean Up</b>	Sweep up and shovel into suitable containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.
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## 7. Handling and storage

<b>Handling</b>	Do not get in eyes, on skin, or on clothing. Take precautionary measures against static discharges. Remove and wash contaminated clothing and gloves, including the inside, before re-use. Avoid breathing vapors or mists. Do not ingest. If swallowed then seek immediate medical assistance. Handle product only in closed system or provide appropriate exhaust ventilation. Wash thoroughly after handling. Use spark-proof tools and explosion-proof equipment. Use only non-sparking tools. Use only in well-ventilated areas. Keep away from open flames, hot surfaces and sources of ignition.
<b>Storage</b>	Keep in a dry, cool and well-ventilated place. Refer product specification and/or product label for specific storage temperature requirement. Keep away from heat, sparks and flame. Keep containers tightly closed in a dry, cool and well-ventilated place.

## 8. Exposure controls / personal protection

<b>Exposure Guidelines</b>	This product does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.
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<b>Engineering Measures</b>	Ensure adequate ventilation, especially in confined areas. Use explosion-proof
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electrical/ventilating/lighting/equipment.

### Personal Protective Equipment

<b>Eye/face Protection</b>	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
<b>Skin and body protection</b>	Wear appropriate protective gloves and clothing to prevent skin exposure.
<b>Respiratory Protection</b>	Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.
<b>Hygiene Measures</b>	Handle in accordance with good industrial hygiene and safety practice.

## 9. Physical and chemical properties

<b>Physical State</b>	Solid
<b>Appearance</b>	White
<b>Odor</b>	Odorless
<b>Odor Threshold</b>	No information available
<b>pH</b>	No information available
<b>Melting Point/Range</b>	81 - 83 °C / 177.8 - 181.4 °F
<b>Boiling Point/Range</b>	No information available
<b>Flash Point</b>	78 °C / 172.4 °F
<b>Evaporation Rate</b>	Not applicable
<b>Flammability (solid,gas)</b>	No information available
<b>Flammability or explosive limits</b>	
Upper	5.9%
Lower	0.9%
<b>Vapor Pressure</b>	0.3 mmHg @ 25 °C
<b>Vapor Density</b>	Not applicable
<b>Specific Gravity</b>	No information available
<b>Solubility</b>	No information available
<b>Partition coefficient; n-octanol/water</b>	No data available
<b>Autoignition Temperature</b>	526.1 °C / 979 °F
<b>Decomposition Temperature</b>	No information available
<b>Viscosity</b>	Not applicable
<b>Molecular Formula</b>	C10 D8
<b>Molecular Weight</b>	136.22

## 10. Stability and reactivity

<b>Reactive Hazard</b>	None known, based on information available
<b>Stability</b>	Stable under recommended storage conditions. Hygroscopic.
<b>Conditions to Avoid</b>	Keep away from open flames, hot surfaces and sources of ignition. Incompatible products. Exposure to moist air or water.
<b>Incompatible Materials</b>	Strong oxidizing agents
<b>Hazardous Decomposition Products</b>	Carbon monoxide (CO), Carbon dioxide (CO <sub>2</sub> )
<b>Hazardous Polymerization</b>	Hazardous polymerization does not occur.
<b>Hazardous Reactions</b>	None under normal processing.

## 11. Toxicological information



Acute Toxicity**Product Information****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
(2H8)Naphthalene	1146-65-2	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** Not regulated

**TDG** Not regulated

IATA

**UN-No** UN1334

**Proper Shipping Name** NAPHTHALENE, CRUDE

**Hazard Class** 4.1

**Packing Group** III

**IMDG/IMO**

**UN-No** UN1334  
**Proper Shipping Name** NAPHTHALENE, CRUDE  
**Hazard Class** 4.1  
**Packing Group** III

## 15. Regulatory information

**United States of America Inventory**

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
(2H8)Naphthalene	1146-65-2	-	-	-

**Legend:**

**TSCA** - Toxic Substances Control Act, (40 CFR Part 710)

X - Listed

'-' - Not Listed

**TSCA 12(b)** - Notices of Export Not applicable

**International Inventories**

Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
(2H8)Naphthalene	1146-65-2	-	-	214-552-7	-	-	-	-	-

**U.S. Federal Regulations**

**SARA 313** Not applicable

**SARA 311/312 Hazard Categories** See section 2 for more information

**CWA (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.

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

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## 16. Other information

<b>Prepared By</b>	Regulatory Affairs Thermo Fisher Scientific Email: EMSDS.RA@thermofisher.com
<b>Revision Date</b>	19-Jan-2018
<b>Print Date</b>	19-Jan-2018
<b>Revision Summary</b>	This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

**Disclaimer**

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

**End of SDS**

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 02.11.2015

Page 1 of 6

## Nickel Metal Shot,

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

**Product name:** Nickel Metal Shot,

**Manufacturer/Supplier Trade name:**

**Manufacturer/Supplier Article number:** S25444A

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

**Manufacturer Details:**

AquaPhoenix Scientific, Inc  
9 Barnhart Drive, Hanover, PA 17331  
(717) 632-1291

**Supplier Details:**

Fisher Science Education  
6771 Silver Crest Road, Nazareth, PA 18064  
(724)517-1954

**Emergency telephone number:**

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

### SECTION 2: Hazards identification

**Classification of the substance or mixture:**



**Irritant**

Residual powder can cause irritation to eyes and skin sensitization.

**Signal word:** Warning

**Hazard statements:**

Causes eye irritation.

**Precautionary statements:**

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

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

If on skin: Wash with soap and water.

If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do.

Continue rinsing.

Store in a well ventilated place.

Dispose of contents and container as instructed in Section 13.

**Other Non-GHS Classification:**

**WHMIS**

None

**NFPA/HMIS**

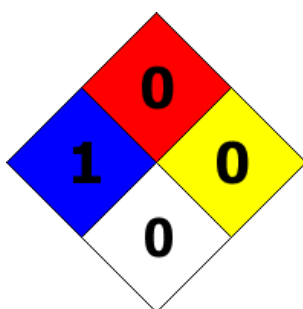
# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 02.11.2015

Page 2 of 6

## Nickel Metal Shot,



NFPA SCALE (0-4)

Health	1
Flammability	0
Physical Hazard	0
Personal Protection	X

HMIS RATINGS (0-4)

### SECTION 3: Composition/information on ingredients

#### Ingredients:

CAS 7440-02-0	Nickel Metal	100 %
Percentages are by weight		

### SECTION 4: First aid measures

#### Description of first aid measures

##### After inhalation:

If inhaled, remove to fresh air.

##### After skin contact:

Wash affected areas with soap and water.

##### After eye contact:

Seek medical attention. Protect unexposed eye. Flush exposed eye gently using water for 15-20 minutes. Remove contact lenses while rinsing.

##### After swallowing:

Rinse mouth with water. Do not induce vomiting. Never give anything by mouth to an unconscious person.

**Most important symptoms and effects, both acute and delayed:** None

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

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

### SECTION 5: Firefighting measures

#### Extinguishing media

##### Suitable extinguishing agents:

Use water, dry chemical, chemical foam, carbon dioxide, or alcohol-resistant foam. Use water spray to cool unopened containers.

##### Unsuitable extinguishing agents:

No information available.

**Special hazards arising from the substance or mixture:** None

#### Advice for firefighters:

##### Protective equipment:

Wear protective eyewear, gloves, and clothing. Refer to Section 8.

##### Additional information (precautions):

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 02.11.2015

Page 3 of 6

## Nickel Metal Shot,

Avoid inhaling gases, fumes, dust, mist, vapor, and aerosols. Avoid contact with skin, eyes, and clothing. Avoid dust generation.

### SECTION 6: Accidental release measures

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

Ensure adequate ventilation. Ensure that air-handling systems are operational.

**Environmental precautions:** None

**Methods and material for containment and cleaning up:** None

**Reference to other sections:** None

### SECTION 7: Handling and storage

#### Precautions for safe handling:

Avoid contact with skin, eyes, and clothing. Do not eat, drink, smoke, or use personal products when handling chemical substances.

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

Provide ventilation for containers.

### SECTION 8: Exposure controls/personal protection



#### Control Parameters:

7440-02-0, Nickel , TWA 1.5 mg/m<sup>3</sup> USA. ACGIH.  
7440-02-0, Nickel, TWA 1.000000 mg/m<sup>3</sup> USA. OSHA.  
7440-02-0 , Nickel, TWA 0.015000 mg/m<sup>3</sup> USA. NIOSH.

#### Appropriate Engineering controls:

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

#### Respiratory protection:

Not required under normal conditions of use.

#### Protection of skin:

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

#### Eye protection:

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

#### General hygienic measures:

Wash hands before breaks and immediately after handling the product. Avoid contact with skin, eyes, and clothing.

### SECTION 9: Physical and chemical properties

<b>Appearance (physical state, color):</b>	Gray solid	<b>Explosion limit lower:</b>	Not Determined
		<b>Explosion limit upper:</b>	Not Determined
<b>Odor:</b>	Odorless	<b>Vapor pressure at 20°C:</b>	1 mm Hg @ 1810°C
<b>Odor threshold:</b>	Not Determined	<b>Vapor density:</b>	Not Determined
<b>pH-value:</b>	9 - 11 at 20 °C	<b>Relative density:</b>	Not Determined

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 02.11.2015

Page 4 of 6

## Nickel Metal Shot,

<b>Melting/Freezing point:</b>	1455°C	<b>Solubilities:</b>	Insoluble.
<b>Boiling point/Boiling range:</b>	2730°C	<b>Partition coefficient (n-octanol/water):</b>	Not Determined
<b>Flash point (closed cup):</b>	Not Determined	<b>Auto/Self-ignition temperature:</b>	87 °C
<b>Evaporation rate:</b>	Not Determined	<b>Decomposition temperature:</b>	Not Determined
<b>Flammability (solid, gaseous):</b>	Flammable	<b>Viscosity:</b>	a. Kinematic: Not Determined b. Dynamic: Not Determined
<b>Density at 20°C:</b>	Not Determined		

### SECTION 10: Stability and reactivity

#### Reactivity:

Nonreactive under normal conditions.

#### Chemical stability:

Stable under normal conditions.

#### Possible hazardous reactions:

None under normal processing.

#### Conditions to avoid:

Incompatible materials. Dust generation. Excessive heat.

#### Incompatible materials:

Reactive with oxidizing agents, combustible materials, metals, acids.

#### Hazardous decomposition products:

Nickel oxides.

### SECTION 11: Toxicological information

#### Acute Toxicity:

##### Oral:

7440-02-0 LD50 oral-rat: 105mg/kg

**Chronic Toxicity:** No additional information.

**Corrosion Irritation:** No additional information.

#### Sensitization:

Irritating to skin and gastrointestinal tract.

**Numerical Measures:** No additional information.

#### Carcinogenicity:

7440-02-0 : IARC: 2B - Group 2B: Possibly carcinogenic to humans (Nickel) NTP: Reasonably anticipated to be a human carcinogen (Nickel)

**Mutagenicity:** No additional information.

**Reproductive Toxicity:** No additional information.

### SECTION 12: Ecological information

**Ecotoxicity:** No additional information.

**Persistence and degradability:** No additional information.

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 02.11.2015

Page 5 of 6

## Nickel Metal Shot,

**Bioaccumulative potential:** No additional information.

**Mobility in soil:** No additional information.

**Other adverse effects:** No additional information.

### SECTION 13: Disposal considerations

#### Waste disposal recommendations:

Dispose of empty containers as unused product. It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities (US 40CFR262.11).

### SECTION 14: Transport information

#### US DOT

##### UN Number:

ADR, ADN, DOT, IMDG, IATA

N/A

##### Limited Quantity Exception:

None

##### Bulk:

**RQ (if applicable):** None

**Proper shipping Name:** Not Classified.

**Hazard Class:** None

**Packing Group:** Not Classified.

**Marine Pollutant (if applicable):** No additional information.

**Comments:** None

##### Non Bulk:

**RQ (if applicable):** None

**Proper shipping Name:** Not Classified.

**Hazard Class:** None

**Packing Group:** Not Classified.

**Marine Pollutant (if applicable):** No additional information.

**Comments:** None

### SECTION 15: Regulatory information

#### United States (USA)

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

Chronic

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

7440-02-0 Nickel.

##### RCRA (hazardous waste code):

None of the ingredients are listed.

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

All ingredients are listed.

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

7440-02-0 Nickel 100 lbs.

#### Proposition 65 (California):

##### Chemicals known to cause cancer:

None of the ingredients are listed.



## Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 02.11.2015

Page 6 of 6

### Nickel Metal Shot,

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

None of the ingredients are listed.

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

None of the ingredients are listed.

#### Chemicals known to cause developmental toxicity:

None of the ingredients are listed.

### Canada

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

All ingredients are listed.

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

7440-02-0 Nickel.

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

None of the ingredients are listed.

### SECTION 16: Other information

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

**GHS Full Text Phrases:** None

**Abbreviations and Acronyms:** None

**Effective date:** 02.11.2015

**Last updated:** 06.24.2015

## SAFETY DATA SHEET

Creation Date 26-Sep-2009

Revision Date 24-Jan-2018

Revision Number 4

### 1. Identification

**Product Name** Propylbenzene

**Cat No. :** AC418430000; AC418430250; AC418431000; AC418435000

**CAS-No** 103-65-1  
**Synonyms** 1-Phenyl Propane.

**Recommended Use** Laboratory chemicals.  
**Uses advised against** Food, drug, pesticide or biocidal product use.  
**Details of the supplier of the safety data sheet**

**Company**

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

**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
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  
May cause respiratory irritation



### Precautionary Statements

#### Prevention

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

#### Ingestion

IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician  
 Do NOT induce vomiting

#### Fire

In case of fire: Use CO<sub>2</sub>, 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

Component	CAS-No	Weight %
Propyl benzene	103-65-1	>95

## 4. First-aid measures

<b>Eye Contact</b>	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.
<b>Skin Contact</b>	Wash off immediately with plenty of water for at least 15 minutes. Get medical attention.
<b>Inhalation</b>	Remove to fresh air. If not breathing, give artificial respiration. 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. Get medical attention. Risk of serious damage to the lungs (by aspiration).
<b>Ingestion</b>	Do NOT induce vomiting. Call a physician or poison control center immediately. If vomiting occurs naturally, have victim lean forward.

<b>Most important symptoms and effects</b>	Difficulty in breathing. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting
<b>Notes to Physician</b>	Treat symptomatically

## 5. Fire-fighting measures

<b>Suitable Extinguishing Media</b>	Water spray. Carbon dioxide (CO <sub>2</sub> ). Dry chemical. Water mist may be used to cool closed containers. Chemical foam. Water mist may be used to cool closed containers.
<b>Unsuitable Extinguishing Media</b>	No information available
<b>Flash Point</b>	47 °C / 116.6 °F
<b>Method -</b>	No information available
<b>Autoignition Temperature</b>	450 °C / 842 °F
<b>Explosion Limits</b>	
<b>Upper</b>	6.00%
<b>Lower</b>	.80%
<b>Sensitivity to Mechanical Impact</b>	No information available
<b>Sensitivity to Static Discharge</b>	No information available

### Specific Hazards Arising from the Chemical

Flammable. Vapors may travel to source of ignition and flash back. Containers may explode when heated. Vapors may form explosive mixtures with air.

### Hazardous Combustion Products

Carbon monoxide (CO). Carbon dioxide (CO<sub>2</sub>).

### 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

<b>Personal Precautions</b>	Ensure adequate ventilation. Use personal protective equipment as required. Remove all sources of ignition. Take precautionary measures against static discharges.
<b>Environmental Precautions</b>	Do not flush into surface water or sanitary sewer system.
<b>Methods for Containment and Clean Up</b>	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

<b>Handling</b>	Ensure adequate ventilation. Wear personal protective equipment/face protection. Avoid contact with skin and eyes. Do not breathe mist/vapors/spray. Use spark-proof tools and explosion-proof equipment. Use only non-sparking tools. Wash hands before breaks and immediately after handling the product. Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharges.
<b>Storage</b>	Keep away from heat, sparks and flame. Flammables area. Keep container tightly closed in a dry and well-ventilated place.

## 8. Exposure controls / personal protection

<b>Exposure Guidelines</b>	This product does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.
<b>Engineering Measures</b>	Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting/equipment.
<b>Personal Protective Equipment</b>	
<b>Eye/face Protection</b>	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
<b>Skin and body protection</b>	Wear appropriate protective gloves and clothing to prevent skin exposure.
<b>Respiratory Protection</b>	No protective equipment is needed under normal use conditions.
<b>Hygiene Measures</b>	Handle in accordance with good industrial hygiene and safety practice.

## 9. Physical and chemical properties

<b>Physical State</b>	Liquid
<b>Appearance</b>	Light yellow
<b>Odor</b>	aromatic
<b>Odor Threshold</b>	No information available
<b>pH</b>	No information available
<b>Melting Point/Range</b>	-99 °C / -146.2 °F
<b>Boiling Point/Range</b>	158 °C / 316.4 °F @ 760 mmHg
<b>Flash Point</b>	47 °C / 116.6 °F
<b>Evaporation Rate</b>	No information available
<b>Flammability (solid,gas)</b>	Not applicable
<b>Flammability or explosive limits</b>	
<b>Upper</b>	6.00%
<b>Lower</b>	.80%
<b>Vapor Pressure</b>	No information available
<b>Vapor Density</b>	4.1
<b>Specific Gravity</b>	0.860
<b>Solubility</b>	Insoluble in water
<b>Partition coefficient; n-octanol/water</b>	No data available
<b>Autoignition Temperature</b>	450 °C / 842 °F
<b>Decomposition Temperature</b>	No information available
<b>Viscosity</b>	No information available
<b>Molecular Formula</b>	C9 H12
<b>Molecular Weight</b>	120.19

## 10. Stability and reactivity

<b>Reactive Hazard</b>	None known, based on information available
<b>Stability</b>	No information available.
<b>Conditions to Avoid</b>	Keep away from open flames, hot surfaces and sources of ignition. Incompatible products.
<b>Incompatible Materials</b>	Strong oxidizing agents
<b>Hazardous Decomposition Products</b>	Carbon monoxide (CO), Carbon dioxide (CO <sub>2</sub> )

**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
Propyl benzene	LD50 = 6040 mg/kg ( Rat )	Not listed	LC50 = 65000 ppm ( Rat ) 2 h

**Toxicologically Synergistic Products** No information available

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

**Irritation** May cause irritation of respiratory tract

**Sensitization** No information available

**Carcinogenicity** The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Propyl benzene	103-65-1	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** Category 1

**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.

## 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.

**Persistence and Degradability** Persistence is unlikely

**Bioaccumulation/ Accumulation** No information available.

**Mobility** Is not likely mobile in the environment due its low water solubility.

Component	log Pow
Propyl benzene	3.68

## 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 UN2364  
 Proper Shipping Name N-PROPYL BENZENE  
 Hazard Class 3  
 Packing Group III

**TDG**

UN-No UN2364  
 Proper Shipping Name N-PROPYL BENZENE  
 Hazard Class 3  
 Packing Group III

**IATA**

UN-No UN2364  
 Proper Shipping Name n-PROPYLBENZENE  
 Hazard Class 3  
 Packing Group III

**IMDG/IMO**

UN-No UN2364  
 Proper Shipping Name PROPYLBENZENE  
 Hazard Class 3  
 Packing Group III

## 15. Regulatory information

**United States of America Inventory**

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
Propyl benzene	103-65-1	X	ACTIVE	-

**Legend:**

**TSCA** - Toxic Substances Control Act, (40 CFR Part 710)

X - Listed

'-' - Not Listed

**TSCA 12(b)** - Notices of Export Not applicable

**International Inventories**

Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
Propyl benzene	103-65-1	X	-	203-132-9	X	X	X	X	KE-29781

**U.S. Federal Regulations**

**SARA 313** Not applicable

**SARA 311/312 Hazard Categories** See section 2 for more information

**CWA (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.

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

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Propyl benzene	X	X	X	-	-

**U.S. Department of Transportation**

Reportable Quantity (RQ): N

DOT Marine Pollutant N

DOT Severe Marine Pollutant N

**U.S. Department of Homeland Security** This product does not contain any DHS chemicals.

**Other International Regulations**

**Mexico - Grade** No information available

## 16. Other information

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

**Creation Date** 26-Sep-2009

**Revision Date** 24-Jan-2018

**Print Date** 24-Jan-2018

**Revision Summary** This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

**Disclaimer**

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

**End of SDS**



## 1,2,4-trimethylbenzene

Version number: GHS 2.0  
Replaces version of: 25.02.2016 (GHS 1)

Revision: 13.10.2017

### SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

#### 1.1 Product identifier

Identification of the substance **1,2,4-trimethylbenzene**  
Registration number (REACH) 01-2119472135-42-xxxx  
EC number 202-436-9  
Index No -  
CAS number 95-63-6  
Additional relevant and available information Pseudocumene

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

Relevant identified uses industrial use (SCC)

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

DHC Solvent Chemie GmbH  
Timmerhellstraße 28  
D-45478 Mülheim an der Ruhr  
Germany

Telephone: +49 (208) 9940-0  
Telefax: +49 (208) 9940-150

Competent person responsible for the safety data sheet Vanessa Manz  
e-mail (competent person) productsafety@dhc-solvent.de

#### 1.4 Emergency telephone number

Emergency information service

Poison centre	
Country	Telephone
United Kingdom	+44 1235 239670

### SECTION 2: HAZARDS IDENTIFICATION

#### 2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008 (CLP)

Hazard class	Category	Hazard class and category	Hazard statement
flammable liquid	Cat. 3	(Flam. Liq. 3)	H226
acute toxicity (inhal.)	Cat. 4	(Acute Tox. 4)	H332
skin corrosion/irritation	Cat. 2	(Skin Irrit. 2)	H315
serious eye damage/eye irritation	Cat. 2	(Eye Irrit. 2)	H319
specific target organ toxicity - single exposure (respiratory tract irritation)	Cat. 3	(STOT SE 3)	H335
aspiration hazard	Cat. 1	(Asp. Tox. 1)	H304
hazardous to the aquatic environment - chronic hazard	Cat. 2	(Aquatic Chronic 2)	H411

## 1,2,4-trimethylbenzene

Version number: GHS 2.0  
Replaces version of: 25.02.2016 (GHS 1)

Revision: 13.10.2017

### Remarks

For full text of H-phrases: see SECTION 16.  
Substance with a community indicative occupational exposure limit value.

### The most important adverse physicochemical, human health and environmental effects

May be fatal if swallowed and enters airways.  
The product is combustible and can be ignited by potential ignition sources.

## 2.2 Label elements

### Labelling according to Regulation (EC) No 1272/2008 (CLP)

#### Signal word

**Danger**

#### Pictograms

GHS02, GHS07,  
GHS08, GHS09



### Hazard statements

H226	Flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H335	May cause respiratory irritation.
H411	Toxic to aquatic life with long lasting effects.

### Precautionary statements

#### Precautionary statements - prevention

P210	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P243	Take action to prevent static discharges.
P273	Avoid release to the environment.
P280	Wear protective gloves/protective clothing/eye protection/face protection.

#### Precautionary statements - response

P301+P310	IF SWALLOWED: Immediately call a POISON CENTER/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.
P331	Do NOT induce vomiting.
P370+P378	In case of fire: Use sand, carbon dioxide or powder extinguisher to extinguish.

#### Precautionary statements - storage

P403+P233	Store in a well-ventilated place. Keep container tightly closed.
P403+P235	Store in a well-ventilated place. Keep cool.

#### Precautionary statements - disposal

P501	Dispose of contents/container in accordance with local/regional/national/international regulations.
------	-----------------------------------------------------------------------------------------------------

## 2.3 Other hazards

According to the results of its assessment, this substance is not a PBT or a vPvB.  
Vapour heavier than air, may form an explosive mixture in air: it may be ignited at some distance away from the spill resulting in flashbacks. Flowing product can create electrostatic charge, resulting sparks may ignite or cause an explosion.

## 1,2,4-trimethylbenzene

Version number: GHS 2.0  
Replaces version of: 25.02.2016 (GHS 1)

Revision: 13.10.2017

### SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

#### 3.1 Substances

Name of substance	1,2,4-trimethylbenzene
Registration number (REACH)	01-2119472135-42-xxxx
EC number	202-436-9
CAS number	95-63-6
Index No	-
Molecular formula	C9H12

### SECTION 4: FIRST AID MEASURES

#### 4.1 Description of first aid measures

##### General notes

Do not leave affected person unattended. Remove victim out of the danger area. Keep affected person warm, still and covered. Take off immediately all contaminated clothing. In all cases of doubt, or when symptoms persist, seek medical advice. In case of unconsciousness place person in the recovery position. Never give anything by mouth.

##### Following inhalation

If breathing is irregular or stopped, immediately seek medical assistance and start first aid actions. Provide fresh air.

##### Following skin contact

Wash with plenty of soap and water.

##### Following eye contact

Irrigate copiously with clean, fresh water, holding the eyelids apart. Remove contact lenses, if present and easy to do. Continue rinsing. In all cases of doubt, or when symptoms persist, seek medical advice.

##### Following ingestion

Do NOT induce vomiting. Rinse mouth with water (only if the person is conscious).

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

Choking and suffocation risks. Deficits in perception and coordination, reaction time, or sleepiness.

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

none

### SECTION 5: FIREFIGHTING MEASURES

#### 5.1 Extinguishing media

##### Suitable extinguishing media

carbon dioxide (CO<sub>2</sub>), BC-powder, foam, alcohol resistant foam, water mist

##### Unsuitable extinguishing media

water jet

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

Solvent vapours are heavier than air and may spread along floors. In case of insufficient ventilation and/or in use, may form flammable/explosive vapour-air mixture. May produce toxic fumes of carbon monoxide if burning.

##### Hazardous combustion products

carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>)

## 1,2,4-trimethylbenzene

Version number: GHS 2.0  
Replaces version of: 25.02.2016 (GHS 1)

Revision: 13.10.2017

### 5.3 Advice for firefighters

Wear breathing apparatus if exposed to vapours/dust/spray/gases. Co-ordinate firefighting measures to the fire surroundings. Do not allow firefighting water to enter drains or water courses. Collect contaminated firefighting water separately. Fight fire with normal precautions from a reasonable distance. Keep containers cool with water spray.

## SECTION 6: ACCIDENTAL RELEASE MEASURES

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

#### For non-emergency personnel

Remove persons to safety. Avoid inhaling sprayed product. Wearing of suitable protective equipment (including personal protective equipment referred to under Section 8 of the safety data sheet) to prevent any contamination of skin, eyes and personal clothing. Remove/take off immediately all contaminated clothing and wash it before reuse.

#### For emergency responders

Wear breathing apparatus if exposed to vapours/dust/spray/gases.

### 6.2 Environmental precautions

Keep away from drains, surface and ground water. Retain contaminated washing water and dispose of it. If substance has entered a water course or sewer, inform the responsible authority.

### 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

Wipe up with absorbent material (e.g. cloth, fleece). Collect spillage (sawdust, kieselgur (diatomite), sand, universal binder).

#### Appropriate containment techniques

Use of adsorbent materials. - covering of drains

#### 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

#### Recommendations

##### • Measures to prevent fire as well as aerosol and dust generation

Use only in well-ventilated areas. Use local and general ventilation. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilating/lighting equipment. Use only non-sparking tools.

##### • Warning

Vapours are heavier than air, spread along floors and form explosive mixtures with air.

#### Advice on general occupational hygiene

Wash hands after use. Do not eat, drink and smoke in work areas. Remove contaminated clothing and protective equipment before entering eating areas. Never keep food or drink in the vicinity of chemicals. Never place chemicals in containers that are normally used for food or drink. Keep away from food, drink and animal feed-stuffs.

## 1,2,4-trimethylbenzene

Version number: GHS 2.0  
Replaces version of: 25.02.2016 (GHS 1)

Revision: 13.10.2017

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

#### Managing of associated risks

- **Explosive atmospheres**

Keep container tightly closed and in a well-ventilated place. Use local and general ventilation. Keep cool. Protect from sunlight.

- **Flammability hazards**

Keep away from sources of ignition - No smoking. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Take precautionary measures against static discharge. Protect from sunlight.

#### Incompatible substances or mixtures

Observe hints for combined storage.

#### Consideration of other advice

- **Ventilation requirements**

Keep any substance that emits harmful vapours or gases in a place that allows these to be permanently extracted. Use local and general ventilation. Ground/bond container and receiving equipment.

- **Packaging compatibilities**

Only packagings which are approved (e.g. acc. to ADR) may be used.

Suitable materials and coatings for container/equipment: Carbon Steel, Stainless Steel, Polyester, Polytetrafluoroethylene (PTFE), Polyvinyl Alcohol (PVA)

Unsuitable Materials and Coatings for container/equipment: Butyl Rubber, Natural Rubber, Ethylene-propylene-diene monomer (EPDM), Polystyrene, Polyethylene, Polyacrylonitrile.

### 7.3 Specific end use(s)

See attached exposure scenarios

## 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/m <sup>3</sup> ]	STEL [ppm]	STEL [mg/m <sup>3</sup> ]	Source
DE	1,2,4-trimethylbenzene	95-63-6	AGW	20	100	40	200	TRGS 900
EU	1,2,4-trimethylbenzene	95-63-6	IOELV	20	100			2017/164/EU
GB	aromatics	95-63-6	WEL		500			EH40/2005
IE	1,2,4-trimethylbenzene	95-63-6	OELV	20	100			S.I. No. 619 of 2001

#### 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.

#### Relevant DNELs/DMELs/PNECs and other threshold levels

## 1,2,4-trimethylbenzene

Version number: GHS 2.0  
Replaces version of: 25.02.2016 (GHS 1)

Revision: 13.10.2017

• **human health values**

Endpoint	Threshold level	Protection goal, route of exposure	Used in	Exposure time
DNEL	100 mg/m <sup>3</sup>	human, inhalatory	worker (industry)	acute - local effects
DNEL	100 mg/m <sup>3</sup>	human, inhalatory	worker (industry)	acute - systemic effects
DNEL	100 mg/m <sup>3</sup>	human, inhalatory	worker (industry)	chronic - local effects
DNEL	16,171 mg/kg	human, dermal	worker (industry)	chronic - systemic effects
DNEL	100 mg/m <sup>3</sup>	human, inhalatory	worker (industry)	chronic - systemic effects
DNEL	29.4 mg/m <sup>3</sup>	human, inhalatory	consumer (private households)	acute - systemic effects
DNEL	29.4 mg/m <sup>3</sup>	human, inhalatory	consumer (private households)	chronic - local effects
DNEL	15 mg/kg	human, oral	consumer (private households)	chronic - systemic effects
DNEL	9,512 mg/kg	human, dermal	consumer (private households)	chronic - systemic effects
DNEL	29.4 mg/m <sup>3</sup>	human, inhalatory	consumer (private households)	chronic - systemic effects

• **environmental values**

End-point	Threshold level	Organism	Environmental compartment	Exposure time
PNEC	0.12 mg/l	aquatic organisms	freshwater	short-term (single instance)
PNEC	0.12 mg/l	aquatic organisms	marine water	short-term (single instance)
PNEC	2.41 mg/l	microorganisms	sewage treatment plant (STP)	short-term (single instance)
PNEC	13.56 mg/kg	benthic organisms	sediments	short-term (single instance)
PNEC	13.56 mg/kg	pelagic organisms	sediments	short-term (single instance)
PNEC	2.34 mg/kg	terrestrial organisms	soil	short-term (single instance)
PNEC	0.12 mg/l	aquatic organisms	water	intermittent release

### 8.2 Exposure controls

**Appropriate engineering controls**

Technical measures and the appliance of appropriate working methods take priority over the use of personal protective equipment.

Safety and necessary control measures vary according to exposure conditions. Appropriate measures are:

Open windows, door, to allow sufficient ventilation. If this is not possible employ a fan to increase air exchange (see attached exposure scenarios).

**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.

Short-term contact with the skin: Disposable gloves

Long-term contact with the skin: Gloves with long cuffs

Check leak-tightness/impermeability prior to use.

## 1,2,4-trimethylbenzene

Version number: GHS 2.0  
Replaces version of: 25.02.2016 (GHS 1)

Revision: 13.10.2017

- **type of material**

NBR: acrylonitrile-butadiene rubber, FKM: fluoro-elastomer

- **material thickness**

0,40 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. Wash hands thoroughly after handling.

Body protection:

Suitable protective clothing: Flame resistant clothing

Suitable safety shoes: Anti static safety shoes according to EN 345 S3

### Respiratory protection

For activities in enclosed areas at elevated temperatures of the substance, local extraction or explosion protected ventilation equipment is recommended. In case this is not sufficient for the intended use, then apply a suitable respiratory protection according to EN 140 type A or better (see exposure scenarios).

### Environmental exposure controls

Do not empty into drains.

## SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

#### Appearance

Physical state	liquid
Colour	colourless
Odour	characteristic

#### Other physical and chemical parameters

pH (value)	not determined
Melting point/freezing point	-43.77 °C
Initial boiling point and boiling range	169.4 °C at 101.3 kPa
Flash point	44 °C at 101.3 kPa
Explosive limits	
• lower explosion limit (LEL)	0.9 vol%
• upper explosion limit (UEL)	6.4 vol%
Vapour pressure	0.3 kPa at 25 °C
Density	0.88 g/cm <sup>3</sup> at 20 °C
Solubility(ies)	
Water solubility	57 mg/l at 25 °C
Partition coefficient	
n-octanol/water (log KOW)	This information is not available.
Auto-ignition temperature	500 °C
Viscosity	
• kinematic viscosity	0.843 mm <sup>2</sup> /s at 20 °C

## 1,2,4-trimethylbenzene

Version number: GHS 2.0  
Replaces version of: 25.02.2016 (GHS 1)

Revision: 13.10.2017

Explosive properties  
in use, may form flammable/explosive vapour-air mixture  
Oxidising properties none

### 9.2 Other information

## SECTION 10: STABILITY AND REACTIVITY

### 10.1 Reactivity

risk of ignition  
• **if heated**  
risk of ignition

### 10.2 Chemical stability

The material is stable under normal ambient and anticipated storage and handling conditions of temperature and pressure (see below "Conditions to avoid").

### 10.3 Possibility of hazardous reactions

No known hazardous reactions.

### 10.4 Conditions to avoid

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

#### Hints to prevent fire or explosion

Use only non-sparking tools.

### 10.5 Incompatible materials

oxidisers

### 10.6 Hazardous decomposition products

No known hazardous decomposition products.

## SECTION 11: TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

**Classification according to GHS (1272/2008/EC, CLP)**

#### Acute toxicity

Harmful if inhaled.

#### • Acute toxicity estimate (ATE)

inhalation: vapour 11 mg<sub>v</sub>/4h

Exposure route	Endpoint	Value	Species
oral	LD50	6,000 mg/kg	rat

#### 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.



## 1,2,4-trimethylbenzene

Version number: GHS 2.0  
Replaces version of: 25.02.2016 (GHS 1)

Revision: 13.10.2017

### 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 (STOT)

#### • 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.

### Information on likely routes of exposure

If on skin. If inhaled.

## SECTION 12: ECOLOGICAL INFORMATION

### 12.1 Toxicity

#### Aquatic toxicity (acute)

Endpoint	Value	Species	Exposure time
LC50	7.72 mg/l	fish	96 h
EC50	2.356 mg/l	algae	96 h

#### Aquatic toxicity (chronic)

May cause long-term adverse effects in the aquatic environment.

### 12.2 Persistence and degradability

Data are not available.

### 12.3 Bioaccumulative potential

Data are not available.

#### BCF

243

### 12.4 Mobility in soil

Data are not available.

### 12.5 Results of PBT and vPvB assessment

According to the results of its assessment, this substance is not a PBT or a vPvB.

### 12.6 Other adverse effects

Data are not available.

## SECTION 13: DISPOSAL CONSIDERATIONS

### 13.1 Waste treatment methods

#### Waste treatment-relevant information

Solvent reclamation/regeneration.

#### Sewage disposal-relevant information

Do not empty into drains.

#### Waste treatment of containers/packagings

Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately re-conditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

## 1,2,4-trimethylbenzene

Version number: GHS 2.0  
Replaces version of: 25.02.2016 (GHS 1)

Revision: 13.10.2017

### List of wastes

Proposed waste code(s) for the used product:  
07 01 04x Other organic solvents, washing liquids and mother liquors

### Remarks

Please consider the relevant national or regional provisions. Waste shall be separated into the categories that can be handled separately by the local or national waste management facilities.

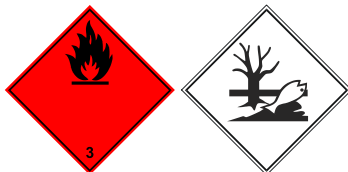
## SECTION 14: TRANSPORT INFORMATION

<b>14.1</b>	UN number	<b>1993</b>
<b>14.2</b>	UN proper shipping name Technical name	<b>FLAMMABLE LIQUID, N.O.S.</b> 1,2,4-trimethylbenzene
<b>14.3</b>	Transport hazard class(es) Class	3 (flammable liquids)
<b>14.4</b>	Packing group	III (substance presenting low danger)
<b>14.5</b>	Environmental hazards	hazardous to the aquatic environment
<b>14.6</b>	Special precautions for user Provisions for dangerous goods (ADR) should be complied within the premises.	
<b>14.7</b>	<b>Transport in bulk according to Annex II of MARPOL and the IBC Code</b> The cargo is not intended to be carried in bulk.	

### Information for each of the UN Model Regulations

#### • Transport of dangerous goods by road, rail and inland waterway (ADR/RID/ADN)

UN number	1993
Proper shipping name	FLAMMABLE LIQUID, N.O.S.
Technical name (hazardous constituents)	1,2,4-trimethylbenzene
Class	3
Classification code	F1
Packing group	III
Danger label(s)	3 + "fish and tree"



Environmental hazards	yes (hazardous to the aquatic environment)
Special provisions (SP)	274, 601
Excepted quantities (EQ)	E1
Limited quantities (LQ)	5 L
Transport category (TC)	3
Tunnel restriction code (TRC)	D/E
Hazard identification No	30
<b>Emergency Action Code</b>	3YE

#### • International Maritime Dangerous Goods Code (IMDG)

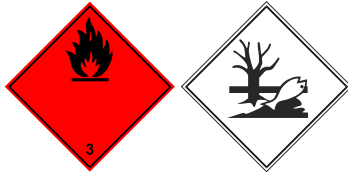
UN number	1993
Proper shipping name	FLAMMABLE LIQUID, N.O.S.
Particulars in the shipper's declaration	UN1993, FLAMMABLE LIQUID, N.O.S., (1,2,4-trimethylbenzene), 3, III, 44°C c.c., MARINE POLLUTANT
Class	3

## 1,2,4-trimethylbenzene

Version number: GHS 2.0  
Replaces version of: 25.02.2016 (GHS 1)

Revision: 13.10.2017

Marine pollutant	yes (hazardous to the aquatic environment)
Packing group	III
Danger label(s)	3 + "fish and tree"



Special provisions (SP)	223, 274, 955
Excepted quantities (EQ)	E1
Limited quantities (LQ)	5 L
EmS	F-E, <u>S-E</u>
Stowage category	A
<b>• International Civil Aviation Organization (ICAO-IATA/DGR)</b>	
UN number	1993
Proper shipping name	Flammable liquid, n.o.s.
Class	3
Environmental hazards	yes (hazardous to the aquatic environment)
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)

**• Restrictions according to REACH, Annex XVII**

Name of substance	CAS No	Wt%	Type of registration	No
1,2,4-trimethylbenzene		100	1907/2006/EC annex XVII	3
1,2,4-trimethylbenzene		100	1907/2006/EC annex XVII	40

**• List of substances subject to authorisation (REACH, Annex XIV)**

not listed

**• 2012/18/EU (Seveso III)**

No	Dangerous substance/hazard categories	Qualifying quantity (tonnes) for the application of lower and upper-tier requirements		Notes
E2	environmental hazards (hazardous to the aquatic environment, cat. 2)	200	500	57)

**Notation**

57) Hazardous to the Aquatic Environment in category Chronic 2.

## 1,2,4-trimethylbenzene

Version number: GHS 2.0  
Replaces version of: 25.02.2016 (GHS 1)

Revision: 13.10.2017

**• Limitation of emissions of volatile organic compounds due to the use of organic solvents in certain paints and varnishes and vehicle refinishing products (2004/42/EC, Deco-Paint Directive)**

VOC content 100 %

**• Directive on industrial emissions (VOCs, 2010/75/EU)**

VOC content 100 %

**• 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

**National inventories**

Country	Inventory	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
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.
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.

## 1,2,4-trimethylbenzene

Version number: GHS 2.0  
Replaces version of: 25.02.2016 (GHS 1)

Revision: 13.10.2017

### 15.2 Chemical Safety Assessment

For this substance a chemical safety assessment has been carried out.

## SECTION 16: OTHER INFORMATION

### 16.1 Indication of changes (revised safety data sheet)

Section	Former entry (text/value)	Actual entry (text/value)
1.3	Competent person responsible for the safety data sheet: Christian Knappe	Competent person responsible for the safety data sheet: Vanessa Manz
1.4		Poison centre: change in the listing (table)
2.2		Precautionary statements - prevention: change in the listing (table)
2.2		Precautionary statements - disposal: change in the listing (table)
6.2	Environmental precautions: Keep away from drains, surface and ground water. Retain contaminated washing water and dispose of it.	Environmental precautions: Keep away from drains, surface and ground water. Retain contaminated washing water and dispose of it. If substance has entered a water course or sewer, inform the responsible authority.
8.1		Occupational exposure limit values (Workplace Exposure Limits): change in the listing (table)
11.1		Information on likely routes of exposure: If on skin. If inhaled.
15.1		• Restrictions according to REACH, Annex XVII: change in the listing (table)
15.1		National inventories: change in the listing (table)
16		Abbreviations and acronyms: change in the listing (table)
16	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) - See attached exposure scenarios <a href="http://www.dhc-solvent.de/dhc_sdbreach.html">http://www.dhc-solvent.de/dhc_sdbreach.html</a>  <a href="http://www.dhc-solvent.de/en/dhc_sdbreach.html">http://www.dhc-solvent.de/en/dhc_sdbreach.html</a> Transport of dangerous goods by road, rail and inland waterway (ADR/RID/ADN). International Maritime Dangerous Goods Code (IMDG). International Air Transport Association (IATA).	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) - The exposure scenarios are available at <a href="http://www.dhc-solvent.de">www.dhc-solvent.de</a> in the Service section. Transport of dangerous goods by road, rail and inland waterway (ADR/RID/ADN). International Maritime Dangerous Goods Code (IMDG). International Air Transport Association (IATA).
16		Disclaimer: This information is based upon the present state of our knowledge. This SDS has been compiled and is solely intended for this product. The information concerning legal regulations can lay no claim to completeness. In addition to this, other provisions may also apply to the product.

### Abbreviations and acronyms

Abbr.	Descriptions of used abbreviations
2017/164/EU	Commission Directive establishing a fourth list of indicative occupational exposure limit values pursuant to Council Directive 98/24/EC, and amending Commission Directives 91/322/EEC, 2000/39/EC and 2009/161/EU
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)
AGW	Workplace exposure limit

## 1,2,4-trimethylbenzene

Version number: GHS 2.0  
Replaces version of: 25.02.2016 (GHS 1)

Revision: 13.10.2017

Abbr.	Descriptions of used abbreviations
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 ( <a href="http://www.nationalarchives.gov.uk/doc/open-government-licence/">http://www.nationalarchives.gov.uk/doc/open-government-licence/</a> )
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)
S.I. No. 619 of 2001	Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001
STEL	Short-term exposure limit
TRGS 900	Arbeitsplatzgrenzwerte (TRGS 900)
TWA	Time-weighted average
VOC	Volatile Organic Compounds
vPvB	Very Persistent and very Bioaccumulative
WEL	Workplace exposure limit

## 1,2,4-trimethylbenzene

Version number: GHS 2.0  
Replaces version of: 25.02.2016 (GHS 1)

Revision: 13.10.2017

### 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)
- The exposure scenarios are available at [www.dhc-solvent.de](http://www.dhc-solvent.de) in the Service section.

Transport of dangerous goods by road, rail and inland waterway (ADR/RID/ADN).  
International Maritime Dangerous Goods Code (IMDG).  
International Air Transport Association (IATA).

### 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.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H335	May cause respiratory irritation.
H411	Toxic to aquatic life with long lasting effects.

### Disclaimer

This information is based upon the present state of our knowledge. This SDS has been compiled and is solely intended for this product. The information concerning legal regulations can lay no claim to completeness. In addition to this, other provisions may also apply to the product.

## SAFETY DATA SHEET

Revision Date 18-Jan-2018

Revision Number 3

### 1. Identification

**Product Name** Sodium Metal  
**Cat No. :** S135-1LB; S206-1LB  
**Synonyms** Natrium.  
**Recommended Use** Laboratory chemicals.  
**Uses advised against** Not for food, drug, pesticide or biocidal product use

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

##### Company

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

##### **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)

Substances/mixtures which, in contact with water, emit flammable gases	Category 1
Skin Corrosion/irritation	Category 1 B
Serious Eye Damage/Eye Irritation	Category 1

#### Label Elements

##### **Signal Word**

Danger

##### **Hazard Statements**

In contact with water releases flammable gases which may ignite spontaneously  
Causes severe skin burns and eye damage



#### **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  
 Keep away from any possible contact with water, because of violent reaction and possible flash fire  
 Handle under inert gas. Protect from moisture

**Response**

Immediately call a POISON CENTER or doctor/physician

**Inhalation**

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

**Skin**

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

Wash contaminated clothing before reuse

Brush off loose particles from skin. Immerse in cool water/wrap with wet bandages

**Eyes**

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

**Ingestion**

IF SWALLOWED: Rinse mouth. DO NOT induce vomiting

**Fire**

In case of fire: Use CO<sub>2</sub>, dry chemical, or foam for extinction

**Storage**

Store locked up

Store in a dry place. Store in a closed container

**Disposal**

Dispose of contents/container to an approved waste disposal plant

**Hazards not otherwise classified (HNOC)**

Reacts violently with water

### 3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Sodium	7440-23-5	100

### 4. First-aid measures

<b>Eye Contact</b>	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
<b>Skin Contact</b>	Wash off immediately with plenty of water for at least 15 minutes.
<b>Inhalation</b>	Move to fresh air.
<b>Ingestion</b>	Do not induce vomiting.
<b>Most important symptoms and effects</b>	Causes burns by all exposure routes. Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation
<b>Notes to Physician</b>	Treat symptomatically

### 5. Fire-fighting measures

<b>Unsuitable Extinguishing Media</b>	No information available
<b>Flash Point Method -</b>	No information available
<b>Autoignition Temperature</b>	115 °C
<b>Explosion Limits</b>	

<b>Upper</b>	No data available
<b>Lower</b>	No data available
<b>Sensitivity to Mechanical Impact</b>	No information available
<b>Sensitivity to Static Discharge</b>	No information available

**Specific Hazards Arising from the Chemical**

Keep product and empty container away from heat and sources of ignition.

**Hazardous Combustion Products**

None known

**Protective Equipment and Precautions for Firefighters**

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

**NFPA**

**Health**  
3

**Flammability**  
3

**Instability**  
2

**Physical hazards**  
W

## 6. Accidental release measures

<b>Personal Precautions</b>	Ensure adequate ventilation. Use personal protective equipment.
<b>Environmental Precautions</b>	See Section 12 for additional ecological information.

**Methods for Containment and Clean Up** No information available.

## 7. Handling and storage

<b>Handling</b>	Ensure adequate ventilation.
<b>Storage</b>	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**

<b>Eye/face Protection</b>	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
<b>Skin and body protection</b>	Wear appropriate protective gloves and clothing to prevent skin exposure.
<b>Respiratory Protection</b>	Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.
<b>Hygiene Measures</b>	Handle in accordance with good industrial hygiene and safety practice.

## 9. Physical and chemical properties

<b>Physical State</b>	Solid
<b>Appearance</b>	Light grey
<b>Odor</b>	Odorless
<b>Odor Threshold</b>	No information available

pH	
Melting Point/Range	98 °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 @ 440 °C
Vapor Density	No information available
Specific Gravity	0.9684 @ 20°C
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	115 °C
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	Na
Molecular Weight	22.99

## 10. Stability and reactivity

Reactive Hazard	Yes
Stability	Stable under normal conditions.
Conditions to Avoid	Incompatible products.
Incompatible Materials	Strong oxidizing agents
Hazardous Decomposition Products	None under normal use conditions
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

## 11. Toxicological information

### Acute Toxicity

#### Component Information

**Toxicologically Synergistic Products** No information available

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

Irritation	No information available
Sensitization	No information available
Carcinogenicity	The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Sodium	7440-23-5	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.

<b>STOT - single exposure</b>	None known
<b>STOT - repeated exposure</b>	None known
<b>Aspiration hazard</b>	No information available
<b>Symptoms / effects, both acute and delayed</b>	Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation
<b>Endocrine Disruptor Information</b>	No information available
<b>Other Adverse Effects</b>	The toxicological properties have not been fully investigated.

## 12. Ecological information

### Ecotoxicity

Do not empty into drains.

<b>Persistence and Degradability</b>	No information available
<b>Bioaccumulation/ Accumulation</b>	No information available.
<b>Mobility</b>	No information available.

## 13. Disposal considerations

<b>Waste Disposal Methods</b>	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

<b>UN-No</b>	UN1428
<b>Proper Shipping Name</b>	SODIUM
<b>Hazard Class</b>	4.3
<b>Packing Group</b>	I

### TDG

<b>UN-No</b>	UN1428
<b>Proper Shipping Name</b>	SODIUM
<b>Hazard Class</b>	4.3
<b>Packing Group</b>	I

### IATA

<b>UN-No</b>	UN1428
<b>Proper Shipping Name</b>	SODIUM
<b>Hazard Class</b>	4.3
<b>Packing Group</b>	I

### IMDG/IMO

<b>UN-No</b>	UN1428
<b>Proper Shipping Name</b>	SODIUM
<b>Hazard Class</b>	4.3
<b>Packing Group</b>	I

## 15. Regulatory information

### International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Sodium	X	X	-	231-132-9	-		X	X	X	X	X

#### Legend:

X - Listed

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

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

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

P - Indicates a commenced PMN substance

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

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

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

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

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

Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

### U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313 Not applicable

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act) Not applicable

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Sodium	X	10 lb	-	-

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration  
Not applicable

CERCLA Not applicable

Component	Hazardous Substances RQs	CERCLA EHS RQs
Sodium	10 lb	-

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

U.S. State Right-to-Know Regulations Not applicable

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Sodium	X	X	X	-	X

### U.S. Department of Transportation

Reportable Quantity (RQ): N

DOT Marine Pollutant N

DOT Severe Marine Pollutant N

### U.S. Department of Homeland Security

This product does not contain any DHS chemicals.

### Other International Regulations

Mexico - Grade No information available

## 16. Other information

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

Revision Date 18-Jan-2018

**Print Date**

18-Jan-2018

**Revision Summary**

This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

**Disclaimer**

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

**End of SDS**

## SAFETY DATA SHEET

Creation Date 05-Oct-2010

Revision Date 19-Jan-2018

Revision Number 3

### 1. Identification

**Product Name** Thallium(I) nitrate

**Cat No. :** AC194240000; AC194240100

**CAS-No** 10102-45-1  
**Synonyms** Thallous Nitrate

**Recommended Use** Laboratory chemicals.  
**Uses advised against** Food, drug, pesticide or biocidal product use.  
**Details of the supplier of the safety data sheet**

**Company**

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

Acros Organics  
One Reagent Lane  
Fair Lawn, NJ 07410

**Emergency Telephone Number**

For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11  
Emergency Number **US**:001-201-796-7100 / **Europe**: +32 14 57 52 99  
**CHEMTREC** Tel. No.**US**:001-800-424-9300 / **Europe**:001-703-527-3887

### 2. Hazard(s) identification

**Classification**

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

Oxidizing solids	Category 3
Acute oral toxicity	Category 2
Acute Inhalation Toxicity - Dusts and Mists	Category 2
Specific target organ toxicity - (repeated exposure)	Category 2
Target Organs - Kidney, Liver.	

**Label Elements**

**Signal Word**

Danger

**Hazard Statements**

May intensify fire; oxidizer  
Fatal if inhaled  
Fatal if swallowed  
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  
 Keep away from heat/sparks/open flames/hot surfaces. - No smoking  
 Do not breathe dust/fume/gas/mist/vapors/spray  
 Use only outdoors or in a well-ventilated area  
 Wear respiratory protection  
 Keep/Store away from clothing/ other combustible materials  
 Take any precaution to avoid mixing with combustibles  
 Wear protective gloves/protective clothing/eye protection/face protection

**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  
 Immediately call a POISON CENTER or doctor/physician

**Ingestion**

IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician  
 Rinse mouth

**Fire**

In case of fire: Use CO<sub>2</sub>, 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

Component	CAS-No	Weight %
Thallium(I) nitrate	10102-45-1	>95

### 4. First-aid measures

**General Advice**

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

**Eye Contact**

In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice. 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. Immediate medical attention is required.

**Inhalation**

Remove to fresh air. If not breathing, give artificial respiration. Immediate medical attention



is required. 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.

<b>Ingestion</b>	Do NOT induce vomiting. Call a physician or poison control center immediately.
<b>Most important symptoms and effects</b>	None reasonably foreseeable.
<b>Notes to Physician</b>	Treat symptomatically

## 5. Fire-fighting measures

<b>Suitable Extinguishing Media</b>	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
<b>Unsuitable Extinguishing Media</b>	No information available
<b>Flash Point</b>	No information available
<b>Method -</b>	No information available
<b>Autoignition Temperature</b>	No information available
<b>Explosion Limits</b>	
<b>Upper</b>	No data available
<b>Lower</b>	No data available
<b>Oxidizing Properties</b>	Oxidizer
<b>Sensitivity to Mechanical Impact</b>	No information available
<b>Sensitivity to Static Discharge</b>	No information available

### Specific Hazards Arising from the Chemical

Oxidizer: Contact with combustible/organic material may cause fire. May ignite combustibles (wood paper, oil, clothing, etc.).

### Hazardous Combustion Products

Nitrogen oxides (NO<sub>x</sub>).

### 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**  
4

**Flammability**  
1

**Instability**  
2

**Physical hazards**  
OX

## 6. Accidental release measures

<b>Personal Precautions</b>	Use personal protective equipment as required. Ensure adequate ventilation. Avoid dust formation. Keep people away from and upwind of spill/leak. Evacuate personnel to safe areas.
<b>Environmental Precautions</b>	Should not be released into the environment.

**Methods for Containment and Clean Up** Sweep up and shovel into suitable containers for disposal. Avoid dust formation.

## 7. Handling and storage

<b>Handling</b>	Wear personal protective equipment/face protection. Avoid dust formation. Do not get in eyes, on skin, or on clothing. Do not breathe (dust, vapor, mist, gas). Do not ingest. If swallowed then seek immediate medical assistance. Use only under a chemical fume hood.
<b>Storage</b>	Keep containers tightly closed in a dry, cool and well-ventilated place. Do not store near combustible materials. Store under an inert atmosphere. Protect from moisture. Keep

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

## 8. Exposure controls / personal protection

### Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Thallium(I) nitrate	TWA: 0.02 mg/m <sup>3</sup> Skin	Skin	IDLH: 15 mg/m <sup>3</sup> TWA: 0.1 mg/m <sup>3</sup>	TWA: 0.1 mg/m <sup>3</sup>

### Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

### Engineering Measures

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

### Personal Protective Equipment

#### Eye/face Protection

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	White
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	206 °C / 402.8 °F
Boiling Point/Range	433 °C / 811.4 °F @ 760 mmHg
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	No information available
Vapor Density	Not applicable
Specific Gravity	No information available
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	450 °C
Viscosity	Not applicable
Molecular Formula	N O3 Tl
Molecular Weight	266.38

## 10. Stability and reactivity

<b>Reactive Hazard</b>	Yes
<b>Stability</b>	Oxidizer: Contact with combustible/organic material may cause fire. Hygroscopic.
<b>Conditions to Avoid</b>	Incompatible products. Excess heat. Combustible material. Avoid dust formation. Exposure to moist air or water.
<b>Incompatible Materials</b>	Strong oxidizing agents, Reducing Agent, Strong acids, Strong reducing agents, Combustible material
<b>Hazardous Decomposition Products</b>	Nitrogen oxides (NOx)
<b>Hazardous Polymerization</b>	Hazardous polymerization does not occur.
<b>Hazardous Reactions</b>	None under normal processing.

## 11. Toxicological information

### Acute Toxicity

#### Product Information

#### Component Information

**Toxicologically Synergistic Products** No information available

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

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

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Thallium(I) nitrate	10102-45-1	Not listed	Not listed	Not listed	Not listed	Not listed

<b>Mutagenic Effects</b>	No information available
<b>Reproductive Effects</b>	No information available.
<b>Developmental Effects</b>	No information available.
<b>Teratogenicity</b>	No information available.
<b>STOT - single exposure</b>	None known
<b>STOT - repeated exposure</b>	Kidney Liver
<b>Aspiration hazard</b>	No information available
<b>Symptoms / effects,both acute and delayed</b>	No information available
<b>Endocrine Disruptor Information</b>	No information available
<b>Other Adverse Effects</b>	The toxicological properties have not been fully investigated.

## 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.

**Persistence and Degradability** Soluble in water Persistence is unlikely based on information available.

**Bioaccumulation/ Accumulation** No information available.

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

### 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
Thallium(I) nitrate - 10102-45-1	U217	-

### 14. Transport information

#### DOT

UN-No UN2727  
 Proper Shipping Name THALLIUM NITRATE  
 Hazard Class 6.1  
 Subsidiary Hazard Class 5.1  
 Packing Group II

#### TDG

UN-No UN2727  
 Proper Shipping Name THALLIUM NITRATE  
 Hazard Class 6.1  
 Subsidiary Hazard Class 5.1  
 Packing Group II

#### IATA

UN-No UN2727  
 Proper Shipping Name THALLIUM NITRATE  
 Hazard Class 6.1  
 Subsidiary Hazard Class 5.1  
 Packing Group II

#### IMDG/IMO

UN-No UN2727  
 Proper Shipping Name THALLIUM NITRATE  
 Hazard Class 6.1  
 Subsidiary Hazard Class 5.1  
 Packing Group II

### 15. Regulatory information

#### United States of America Inventory

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
Thallium(I) nitrate	10102-45-1	X	ACTIVE	-

#### Legend:

TSCA - Toxic Substances Control Act, (40 CFR Part 710)

X - Listed

'-' - Not Listed

**TSCA 12(b)** - Notices of Export Not applicable

#### International Inventories

Canada (DSL/NDL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
Thallium(I) nitrate	10102-45-1	-	X	233-273-1	X	X	X	X	X

**U.S. Federal Regulations****SARA 313**

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Thallium(I) nitrate	10102-45-1	>95	1.0

**SARA 311/312 Hazard Categories** See section 2 for more information

**CWA (Clean Water Act)**

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Thallium(I) nitrate	-	-	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
Thallium(I) nitrate	100 lb	-

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

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

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Thallium(I) nitrate	X	X	X	X	-

**U.S. Department of Transportation**

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

**U.S. Department of Homeland Security** This product does not contain any DHS chemicals.

**Other International Regulations**

**Mexico - Grade** No information available

## 16. Other information

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

**Creation Date** 05-Oct-2010

**Revision Date** 19-Jan-2018

**Print Date** 19-Jan-2018

**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).

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**End of SDS**

# Material Safety Data Sheet

## Toluene

ACC# 23590

### Section 1 - Chemical Product and Company Identification

**MSDS Name:** Toluene

**Catalog Numbers:** AC167900000, AC167900025, AC176850000, AC176850025, AC176850050, AC176850051, AC176850250, AC176855000, AC177160000, AC177160025, AC177160050, AC177160100, AC177160250, AC268370000, AC268370010, AC326980000, AC326980010, AC326981000, AC326982500, AC332070000, AC332070010, AC332070025, AC364410000, AC364410010, AC364410025, AC364411000, AC364415000, AC379140010, AC379140025, AC386760000, AC386760050, AC421160000, AC421160010, AC421160040, AC421170000, AC424550000, AC424550250, AC610590190, AC610590500, AC610591150, AC610592000, AC610790190, AC610790500, AC610791150, AC610792000, 16790-0010, 17685-0010, 17716-0010, 26837-0025, 42117-0040, 42117-5000, 42455-0010, 42455-5000, 61011-0040, 61046-0010, 61046-1000, 61095-1000, BP2625100, S80229HPLC, T288-1, T288RS-19, T290-1, T290-1LC, T290-4, T290N-219, T290RS-19, T290RS-200, T290RS-28, T290SK-1, T290SK-4, T290SS-115, T290SS-200, T290SS-28, T290SS-50, T291-4, T291-4LC, T291RS-200, T291SK-4, T291SK4, T291SS19, T313-4, T313SK-4, T323-20, T323-4, T324-1, T324-20, T324-200, T324-200LC, T324-20LC, T324-4, T324-500, T324CU1300, T324FB-115, T324FB-19, T324FB-200, T324FB-50, T324J-500, T324POP-200, T324POPB-200, T324RB-115, T324RB-19, T324RB-200, T324RS-115, T324RS-19, T324RS-200, T324RS-28, T324RS-50, T324S-4, T324SK-4, T324SS-115, T324SS-200, T324SS-28, T324SS-50, T326F-1GAL, T326P-4, T326S-20, T326S20LC, T330-4

**Synonyms:** Methylbenzene; Methylbenzol; Phenylmethane; Toluol.**Company Identification:**

Fisher Scientific  
1 Reagent Lane  
Fair Lawn, NJ 07410

**For information, call:** 201-796-7100**Emergency Number:** 201-796-7100**For CHEMTREC assistance, call:** 800-424-9300**For International CHEMTREC assistance, call:** 703-527-3887

### Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
108-88-3	Toluene	>99	203-625-9

### Section 3 - Hazards Identification

#### EMERGENCY OVERVIEW

Appearance: colorless liquid. Flash Point: 4 deg C.

**Warning! Flammable liquid and vapor.** Causes eye, skin, and respiratory tract irritation. Breathing vapors may cause drowsiness and dizziness. May be absorbed through intact skin. Aspiration hazard if swallowed. Can enter lungs and cause damage. Possible risk of harm to the unborn child. May cause central nervous system depression. May cause liver and kidney damage.

**Target Organs:** Kidneys, central nervous system, liver, respiratory system, eyes, skin.**Potential Health Effects****Eye:** Causes eye irritation. Vapors may cause eye irritation.**Skin:** Causes skin irritation. May be absorbed through the skin. Repeated or prolonged exposure may cause

drying and cracking of the skin. Not expected to cause an allergic skin reaction.

**Ingestion:** May cause effects similar to those for inhalation exposure. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal. May cause central nervous system depression.

**Inhalation:** Causes respiratory tract irritation. Inhalation of high concentrations (>200 ppm) of toluene are clearly associated with CNS encephalopathy, headache, depression, lassitude (weakness, exhaustion), impaired coordination, transient memory loss, and impaired reaction time.

**Chronic:** Prolonged or repeated skin contact may cause defatting and dermatitis. Repeated exposure in combination with constant, loud noise can produce hearing loss and dizziness. Chronic hydrocarbon abuse (for example, sniffing glue or light hydrocarbons such as contained in this material) has been associated with irregular heart rhythms and potential cardiac arrest. Toluene abuse has been linked with kidney disease, as evidenced by blood, protein, & pus in the urine, accompanied by elevated serum creatinine, decreased urinary output, & metabolic & renal tubular acidosis. Although kidney toxicity has not been common in cases of occupational toluene exposure, there has been at least one report of renal toxicity following a 40-year occupational toluene exposure. Toluene does not cause the severe injury to the bone marrow that is characteristic of benzene poisoning. Intentional abuse of toluene vapors has been linked to damage of the brain, liver, kidney and to death. Repeated inhalation exposure of toluene to animals causes histological changes in the brain, degeneration of the heart tissue, and possible immune

## Section 4 - First Aid Measures

**Eyes:** In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical aid.

**Skin:** In case of contact, flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical aid if irritation develops and persists. Wash clothing before reuse.

**Ingestion:** Potential for aspiration if swallowed. Get medical aid immediately. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If vomiting occurs naturally, have victim lean forward.

**Inhalation:** If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

**Notes to Physician:** Causes cardiac sensitization to endogenous catecholamines which may lead to cardiac arrhythmias. Do NOT use adrenergic agents such as epinephrine or pseudoepinephrine.

## 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. Water runoff can cause environmental damage. Dike and collect water used to fight fire. Use water spray to keep fire-exposed containers cool. Water may be ineffective. Material is lighter than water and a fire may be spread by the use of water. Flammable liquid and vapor. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas. This liquid floats on water and may travel to a source of ignition and spread fire. May accumulate static electricity.

**Extinguishing Media:** Use water spray, dry chemical, carbon dioxide, or appropriate foam. Solid streams of water may be ineffective and spread material.

**Flash Point:** 4 deg C ( 39.20 deg F)

**Autoignition Temperature:** 480 deg C ( 896.00 deg F)

**Explosion Limits, Lower:** 1.1 vol%

**Upper:** 7.1 vol%

**NFPA Rating:** (estimated) Health: 2; Flammability: 3; 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. Remove all sources of ignition. Provide ventilation. Use only non-sparking tools and equipment.



Control runoff and isolate discharged material for proper disposal. Use water spray to cool and disperse vapors and protect personnel.

## Section 7 - Handling and Storage

**Handling:** Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Keep away from heat, sparks and flame. Avoid breathing vapor or mist.

**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. Separate from oxidizing materials.

## 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 general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits. Ventilation fans and other electrical service must be non-sparking and have an explosion-proof design.

### Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Toluene	20 ppm TWA	100 ppm TWA; 375 mg/m <sup>3</sup> TWA 500 ppm IDLH	200 ppm TWA; 300 ppm Ceiling

**OSHA Vacated PELs:** Toluene: 100 ppm TWA; 375 mg/m<sup>3</sup> TWA

### Personal Protective Equipment

**Eyes:** Wear chemical splash goggles.

**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.

## Section 9 - Physical and Chemical Properties

**Physical State:** Liquid

**Appearance:** colorless

**Odor:** sweetish odor - pleasant odor - benzene-like

**pH:** Not applicable.

**Vapor Pressure:** 28.4 mm Hg @ 25 deg C

**Vapor Density:** 3.1 (Air=1)

**Evaporation Rate:** 2.4 (Butyl acetate=1)

**Viscosity:** 0.59 cps @ 20 deg C

**Boiling Point:** 110.6 deg C

**Freezing/Melting Point:** -95 deg C

**Decomposition Temperature:** Not available.

**Solubility:** Insoluble.

**Specific Gravity/Density:** 0.86 (Water=1)

**Molecular Formula:** C<sub>6</sub>H<sub>5</sub>CH<sub>3</sub>

**Molecular Weight:** 92.14

## Section 10 - Stability and Reactivity

**Chemical Stability:** Stable under normal temperatures and pressures.

**Conditions to Avoid:** Ignition sources, excess heat, confined spaces.

**Incompatibilities with Other Materials:** Strong oxidizing agents, nitric acid, sulfuric acid.

**Hazardous Decomposition Products:** Carbon monoxide, carbon dioxide.

**Hazardous Polymerization:** Has not been reported.

## Section 11 - Toxicological Information

**RTECS#:**

**CAS#** 108-88-3: XS5250000

**LD50/LC50:**

CAS# 108-88-3:

- Draize test, rabbit, eye: 870 ug Mild;
- Draize test, rabbit, eye: 2 mg/24H Severe;
- Draize test, rabbit, skin: 435 mg Mild;
- Draize test, rabbit, skin: 500 mg Moderate;
- Draize test, rabbit, skin: 20 mg/24H Moderate;
- Inhalation, mouse: LC50 = 400 ppm/24H;
- Inhalation, mouse: LC50 = 30000 mg/m<sup>3</sup>/2H;
- Inhalation, mouse: LC50 = 19900 mg/m<sup>3</sup>/7H;
- Inhalation, mouse: LC50 = 10000 mg/m<sup>3</sup>;
- Inhalation, rat: LC50 = 49 gm/m<sup>3</sup>/4H;
- Oral, rat: LD50 = 636 mg/kg;
- Skin, rabbit: LD50 = 14100

**Carcinogenicity:**

CAS# 108-88-3: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

**Epidemiology:** No information available.

**Teratogenicity:** In an epidemiologic study of toluene and pregnancy, occupational exposures to toluene were said to be associated with an increased incidence of renal, urinary, gastrointestinal, and cardiac anomalies. Fetotoxicity (reduced fetal weight), behavioural effects (effects on learning and memory) and hearing loss (in males) were observed in the offspring of rats exposed by inhalation to toluene, in the absence of maternal toxicity.

**Reproductive Effects:** Many reports of reproductive effects of toluene abuse or heavy occupational exposure are confounded by mixed solvent exposure or fetal alcohol syndrome. Women exposed to toluene in lab work had a 4.7-fold increased risk of spontaneous abortions.

**Mutagenicity:** No information available.

**Neurotoxicity:** No information available.

**Other Studies:**

## Section 12 - Ecological Information

**Ecotoxicity:** No data available. Bluegill LC50=17 mg/L/24H Shrimp LC50=4.3 ppm/96H Fathead minnow LC50=36.2 mg/L/96H Sunfish (fresh water) TLm=1180 mg/L/96H

**Environmental:** From soil, substance evaporates and is microbially biodegraded. In water, substance volatilizes and biodegrades.

**Physical:** Photochemically produced hydroxyl radicals degrade substance.

**Other:** 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# 108-88-3: waste number U220.

## Section 14 - Transport Information

	<b>US DOT</b>	<b>Canada TDG</b>
<b>Shipping Name:</b>	TOLUENE	TOLUENE
<b>Hazard Class:</b>	3	3
<b>UN Number:</b>	UN1294	UN1294
<b>Packing Group:</b>	II	II
<b>Additional Info:</b>		FLASHPOINT 4 C

## 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 10/4/82, Sunset 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.

#### CERCLA Hazardous Substances and corresponding RQs

CAS# 108-88-3: 1000 lb final RQ; 454 kg final RQ

#### SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

#### SARA Codes

CAS # 108-88-3: immediate, fire.

#### Section 313

This material contains Toluene (CAS# 108-88-3, >99%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

#### 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

CAS# 108-88-3 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

#### California Prop 65

**WARNING:** This product contains Toluene, a chemical known to the state of California to cause developmental reproductive toxicity.

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 11 Highly flammable.

R 38 Irritating to skin.

R 48/20 Harmful : danger of serious damage to health by prolonged exposure through inhalation.

R 63 Possible risk of harm to the unborn child.

R 65 Harmful: may cause lung damage if swallowed.

R 67 Vapours may cause drowsiness and dizziness.

#### **Safety Phrases:**

S 36/37 Wear suitable protective clothing and gloves.

S 46 If swallowed, seek medical advice immediately and show this container or label.

S 62 If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.

#### **WGK (Water Danger/Protection)**

CAS# 108-88-3: 2

#### **Canada - DSL/NDSL**

CAS# 108-88-3 is listed on Canada's DSL List.

#### **Canada - WHMIS**

This product has a WHMIS classification of B2, D2A, D2B.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

#### **Canadian Ingredient Disclosure List**

CAS# 108-88-3 is listed on the Canadian Ingredient Disclosure List.

## Section 16 - Additional Information

**MSDS Creation Date:** 6/01/1999

**Revision #10 Date:** 2/13/2008

*The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.*

## SAFETY DATA SHEET

Creation Date 15-Jun-2010

Revision Date 31-Jul-2019

Revision Number 7

### 1. Identification

**Product Name** o-Xylene

**Cat No. :** O5081-4; O5081-4LC; O5081-500; O5081FB-200; DO5081-500

**CAS-No** 95-47-6  
**Synonyms** 1,2-Dimethylbenzene (Certified)

**Recommended Use** Laboratory chemicals.  
**Uses advised against** Food, drug, pesticide or biocidal product use

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

##### Company

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

##### **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)

Flammable liquids	Category 3
Acute dermal toxicity	Category 4
Acute Inhalation Toxicity - Vapors	Category 4
Skin Corrosion/irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system, Central nervous system (CNS).	
Specific target organ toxicity - (repeated exposure)	Category 2
Target Organs - Liver.	
Aspiration Toxicity	Category 1

#### Label Elements

**Signal Word**  
Danger

**Hazard Statements**

Flammable liquid and vapor  
May be fatal if swallowed and enters airways  
Harmful in contact with skin  
Causes skin irritation  
Causes serious eye irritation  
Harmful if inhaled  
May cause respiratory 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  
Wash face, hands and any exposed skin thoroughly after handling  
Do not breathe dust/fume/gas/mist/vapors/spray  
Keep away from heat/sparks/open flames/hot surfaces. - No smoking  
Keep container tightly closed  
Ground/bond container and receiving equipment  
Use explosion-proof electrical/ventilating/lighting/equipment  
Use only non-sparking tools  
Take precautionary measures against static discharge  
Keep cool

**Response**

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 if you feel unwell

**Skin**

Call a POISON CENTER or doctor/physician if you feel unwell  
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<sub>2</sub>, dry chemical, or foam for extinction

**Storage**

Store locked up  
Store in a well-ventilated place. Keep container tightly closed

**Disposal**

Dispose of contents/container to an approved waste disposal plant

**Hazards not otherwise classified (HNOC)**

Harmful to aquatic life with long lasting effects

### 3. Composition/Information on Ingredients

Component	CAS-No	Weight %
o-Xylene	95-47-6	>95

### 4. First-aid measures

<b>General Advice</b>	If symptoms persist, call a physician.
<b>Eye Contact</b>	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.
<b>Skin Contact</b>	Wash off immediately with plenty of water for at least 15 minutes. If skin irritation persists, call a physician.
<b>Inhalation</b>	Move to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur. Risk of serious damage to the lungs.
<b>Ingestion</b>	Clean mouth with water and drink afterwards plenty of water. Do not induce vomiting. Call a physician or Poison Control Center immediately. If vomiting occurs naturally, have victim lean forward.
<b>Most important symptoms and effects</b>	Breathing difficulties. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting
<b>Notes to Physician</b>	Treat symptomatically

### 5. Fire-fighting measures

<b>Suitable Extinguishing Media</b>	Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide. Cool closed containers exposed to fire with water spray.
<b>Unsuitable Extinguishing Media</b>	Do not use a solid water stream as it may scatter and spread fire
<b>Flash Point</b>	31 °C / 87.8 °F
<b>Method -</b>	No information available
<b>Autoignition Temperature</b>	465 °C / 869 °F
<b>Explosion Limits</b>	
<b>Upper</b>	6.7 vol %
<b>Lower</b>	0.9 vol %
<b>Sensitivity to Mechanical Impact</b>	No information available
<b>Sensitivity to Static Discharge</b>	No information available

#### Specific Hazards Arising from the Chemical

Flammable. Containers may explode when heated. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back.

#### Hazardous Combustion Products

Carbon monoxide (CO) Carbon dioxide (CO<sub>2</sub>)

#### Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

#### NFPA

<b>Health</b>	<b>Flammability</b>	<b>Instability</b>	<b>Physical hazards</b>
3	3	0	N/A

## 6. Accidental release measures

<b>Personal Precautions</b>	Use personal protective equipment. Ensure adequate ventilation. Remove all sources of ignition. Take precautionary measures against static discharges.
<b>Environmental Precautions</b>	Should not be released into the environment. See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage. Do not flush into surface water or sanitary sewer system.
<b>Methods for Containment and Clean Up</b>	Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

## 7. Handling and storage

<b>Handling</b>	Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Ensure adequate ventilation. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. Take precautionary measures against static discharges.
<b>Storage</b>	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	Mexico OEL (TWA)
o-Xylene	TWA: 100 ppm STEL: 150 ppm		IDLH: 900 ppm TWA: 100 ppm TWA: 435 mg/m <sup>3</sup> STEL: 150 ppm STEL: 655 mg/m <sup>3</sup>	TWA: 100 ppm STEL: 150 ppm

### Legend

ACGIH - American Conference of Governmental Industrial Hygienists

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

<b>Engineering Measures</b>	Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting/equipment.
-----------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

### Personal Protective Equipment

<b>Eye/face Protection</b>	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
<b>Skin and body protection</b>	Long sleeved clothing.
<b>Respiratory Protection</b>	Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.
<b>Hygiene Measures</b>	Handle in accordance with good industrial hygiene and safety practice.

## 9. Physical and chemical properties

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



pH	Not applicable
Melting Point/Range	-25 °C / -13 °F
Boiling Point/Range	143 - 145 °C / 289.4 - 293 °F
Flash Point	31 °C / 87.8 °F
Evaporation Rate	0.7
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	6.7 vol %
Lower	0.9 vol %
Vapor Pressure	882 Pa @ 25 °C
Vapor Density	3.7
Specific Gravity	0.884
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	465 °C / 869 °F
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	C8 H10
Molecular Weight	106.17

## 10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	Stable under normal conditions.
Conditions to Avoid	Incompatible products. Excess heat. Keep away from open flames, hot surfaces and sources of ignition.
Incompatible Materials	Strong oxidizing agents, Strong acids
Hazardous Decomposition Products	Carbon monoxide (CO), Carbon dioxide (CO <sub>2</sub> )
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
o-Xylene	LD50 = 3608 mg/kg ( Rat )	14100 mg/kg (Rabbit)	LC50 = 4330 ppm ( Rat ) 6 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
o-Xylene	95-47-6	Not listed	Not listed	Not listed	Not listed	Not listed

**Mutagenic Effects** No information available

**Reproductive Effects** No information available.

<b>Developmental Effects</b>	No information available.
<b>Teratogenicity</b>	No information available.
<b>STOT - single exposure</b>	Respiratory system Central nervous system (CNS)
<b>STOT - repeated exposure</b>	Liver
<b>Aspiration hazard</b>	Category 1
<b>Symptoms / effects, both acute and delayed</b>	Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting
<b>Endocrine Disruptor Information</b>	No information available
<b>Other Adverse Effects</b>	The toxicological properties have not been fully investigated.

## 12. Ecological information

### Ecotoxicity

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Do not empty into drains. The product contains following substances which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
o-Xylene	EC50: = 4.2 mg/L, 192h (Pseudokirchneriella subcapitata) EC50: = 4.7 mg/L, 72h static (Pseudokirchneriella subcapitata)	LC50: 16.1 mg/L/96h (Lepomis macrochirus) LC50: 13 mg/L/24h (Carassius auratus)	EC50 = 0.0084 mg/L 24 h	EC50: 2.61 - 5.59 mg/L, 48h Flow through (Daphnia magna) EC50: 0.78 - 2.51 mg/L, 48h Static (Daphnia magna) EC50: = 3.2 mg/L, 48h (Daphnia magna)

**Persistence and Degradability** Insoluble in water Persistence is unlikely based on information available.

**Bioaccumulation/ Accumulation** No information available.

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

Component	log Pow
o-Xylene	3.12

## 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

<b>UN-No</b>	UN1307
<b>Proper Shipping Name</b>	XYLENES
<b>Hazard Class</b>	3
<b>Packing Group</b>	III

### TDG

<b>UN-No</b>	UN1307
<b>Proper Shipping Name</b>	XYLENES
<b>Hazard Class</b>	3
<b>Packing Group</b>	III

### IATA

<b>UN-No</b>	UN1307
<b>Proper Shipping Name</b>	Xylenes
<b>Hazard Class</b>	3

<b>Packing Group</b>	III
<b>IMDG/IMO</b>	
<b>UN-No</b>	UN1307
<b>Proper Shipping Name</b>	Xylenes
<b>Hazard Class</b>	3
<b>Packing Group</b>	III

## 15. Regulatory information

### United States of America Inventory

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
o-Xylene	95-47-6	X	ACTIVE	-

#### Legend:

**TSCA** - Toxic Substances Control Act, (40 CFR Part 710)

X - Listed

'-' - Not Listed

**TSCA 12(b)** - Notices of Export      Not applicable

### International Inventories

Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
o-Xylene	95-47-6	X	-	202-422-2	X	X	X	X	KE-35429

### U.S. Federal Regulations

#### SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
o-Xylene	95-47-6	>95	1.0

**SARA 311/312 Hazard Categories**      See section 2 for more information

#### CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
o-Xylene	X	-	-	-

#### Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
o-Xylene	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
o-Xylene	1000 lb	-

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

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

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island

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o-Xylene	X	X	X	X	-
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**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

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<b>16. Other information</b>
------------------------------

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

**Creation Date** 15-Jun-2010  
**Revision Date** 31-Jul-2019  
**Print Date** 31-Jul-2019  
**Revision Summary** SDS sections updated. 11. 16.

**Disclaimer**

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

**End of SDS**

# SAFETY DATA SHEET

Version 8.1  
Revision Date 10/21/2020  
Print Date 09/14/2021

## SECTION 1: Identification of the substance/mixture and of the company/undertaking

### 1.1 Product identifiers

Product name : 4,4'-DDD

Product Number : 49009  
Brand : Supelco  
CAS-No. : 72-54-8

### 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 3), H301  
Acute toxicity, Dermal (Category 4), H312  
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 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**

**SECTION 3: Composition/information on ingredients**

**3.1 Substances**

Synonyms : 1,1-Dichloro-2,2-bis(4-chlorophenyl)ethane  
Formula : C<sub>14</sub>H<sub>10</sub>Cl<sub>4</sub>  
Molecular weight : 320.04 g/mol  
CAS-No. : 72-54-8  
EC-No. : 200-783-0

Component	Classification	Concentration
<b>2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane</b>		
	Acute Tox. 3; Acute Tox. 4; Carc. 2; Aquatic Acute 1; Aquatic Chronic 1; H301, H312, H351, H400, H410 M-Factor - Aquatic Acute: 100	<= 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. 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. 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): 6.1D: 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

---

## **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**

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.

---

## 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	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
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	< 0.000 hPa at 25.0 °C (77.0 °F)
l) Vapor density	No data available
m) Relative density	1.38 g/cm <sup>3</sup>
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	log Pow: 6.02
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 - 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 sensitization

No data available

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: 2A - Group 2A: Probably carcinogenic to humans (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)

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**

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.

---

## **SECTION 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 with long lasting effects.

---

## 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: 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  
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 : yes

### 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)

---

## 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, Chronic Health Hazard

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

2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	CAS-No. 72-54-8	Revision Date 1993-02-16
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### **Pennsylvania Right To Know Components**

2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	CAS-No. 72-54-8	Revision Date 1993-02-16
---------------------------------------------	--------------------	-----------------------------

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

2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	CAS-No. 72-54-8	Revision Date 1993-02-16
---------------------------------------------	--------------------	-----------------------------

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

WARNING! This product contains a chemical known in the State of California to cause cancer. 2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	CAS-No. 72-54-8	Revision Date 2007-09-28
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## **SECTION 16: Other information**

### **Further information**

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Version: 8.1

Revision Date: 10/21/2020

Print Date: 09/14/2021

## SAFETY DATA SHEET

Version 6.2  
Revision Date 04/18/2021  
Print Date 09/11/2021

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : 4,4'-DDE  
Product Number : 35487  
Brand : Sigma-Aldrich  
CAS-No. : 72-55-9

**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**

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  
Specific target organ toxicity - repeated exposure, Oral (Category 1), H372  
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 GHS Label elements, including precautionary statements**

Pictogram



Signal word

Danger

Hazard statement(s)	
H301	Toxic if swallowed.
H351	Suspected of causing cancer.
H372	Causes damage to organs through prolonged or repeated exposure if swallowed.
H410	Very toxic to aquatic life with long lasting effects.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust/ fume/ gas/ mist/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/ doctor. Rinse mouth.
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

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Synonyms	: 1,1-Dichloro-2,2-bis(4-chlorophenyl)ethene
Formula	: C <sub>14</sub> H <sub>8</sub> Cl <sub>4</sub>
Molecular weight	: 318.03 g/mol
CAS-No.	: 72-55-9
EC-No.	: 200-784-6

Component	Classification	Concentration
<b>2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene</b>		
	Acute Tox. 3; Carc. 2; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H301, H351, H372, H400, H410 M-Factor - Aquatic Acute: 100	<= 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. 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  
Combustible.

### 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**

#### **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**

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

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): 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**

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.

---

## 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: 88.0 - 90.0 °C (190.4 - 194.0 °F) |
| f) Initial boiling point and boiling range      | No data available                                      |
| g) Flash point                                  | ( )No data available                                   |
| h) Evaporation rate                             | No data available                                      |
| i) Flammability (solid, gas)                    | No data available                                      |
| j) Upper/lower flammability or explosive limits | No data available                                      |
| k) Vapor pressure                               | < 0.000 hPa                                            |
| l) Vapor density                                | No data available                                      |
| m) Relative density                             | No data available                                      |

- |    |                                           |                   |
|----|-------------------------------------------|-------------------|
| n) | Water solubility                          | No data available |
| o) | Partition coefficient:<br>n-octanol/water | log Pow: 6.51     |
| p) | Autoignition<br>temperature               | No data available |
| q) | Decomposition<br>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, Strong bases

### 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

LD50 Oral - Rat - 87.0 mg/kg

Remarks: The value is given in analogy to the following substances: 1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane

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**

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: 2A - Group 2A: Probably carcinogenic to humans (2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene)

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**

Remarks:

No data available

The value is given in analogy to the following substances: 1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane

Ingestion - Causes damage to organs through prolonged or repeated exposure.

### **Aspiration hazard**

No data available

## **11.2 Additional Information**

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**

Toxicity to fish

LC50 - Pimephales promelas (fathead minnow) - 0.01 mg/l - 96 h  
Remarks: The value is given in analogy to the following substances:  
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane

LC50 - Lepomis macrochirus (Bluegill sunfish) - 0.01 mg/l - 96 h  
Remarks: The value is given in analogy to the following substances:  
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane

LC50 - Oncorhynchus mykiss (rainbow trout) - 0.003400 mg/l - 96 h  
Remarks: The value is given in analogy to the following substances:  
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane

Toxicity to daphnia and other aquatic invertebrates      Immobilization EC50 - Daphnia magna (Water flea) - 0.00108 mg/l - 48 h  
Remarks: The value is given in analogy to the following substances:  
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane

## 12.2 Persistence and degradability

No data available

## 12.3 Bioaccumulative potential

Bioaccumulation      Gambusia affinis (Mosquito fish) - 33 d  
- 3.84 µg/l(2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene)

Bioconcentration factor (BCF): 12,037

## 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

---

## 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: 2811      Class: 6.1

Packing group: III

Proper shipping name: Toxic solids, organic, n.o.s. (2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene)

Reportable Quantity (RQ): 1 lbs

1) 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. (2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene)

Marine pollutant : yes

**IATA**

UN number: 2811 Class: 6.1 Packing group: III

Proper shipping name: Toxic solid, organic, n.o.s. (2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene)

---

**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, 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**

2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene	CAS-No. 72-55-9	Revision Date 1993-02-16
2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene	CAS-No. 72-55-9	Revision Date 1993-02-16

**New Jersey Right To Know Components**

2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene	CAS-No. 72-55-9	Revision Date 1993-02-16
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## SECTION 16: Other information

### Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](http://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: 6.2

Revision Date: 04/18/2021

Print Date: 09/11/2021

## SAFETY DATA SHEET

Version 6.3  
Revision Date 04/18/2021  
Print Date 09/11/2021**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : 4,4'-DDT

Product Number : 386340

Brand : Aldrich

Index-No. : 602-045-00-7

CAS-No. : 50-29-3

**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)**

Acute toxicity, Oral (Category 3), H301  
Acute toxicity, Dermal (Category 3), H311  
Carcinogenicity (Category 2), H351  
Specific target organ toxicity - repeated exposure, Oral (Category 1), H372  
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 GHS Label elements, including precautionary statements**

Pictogram





Signal word	Danger
Hazard statement(s)	
H301 + H311	Toxic if swallowed or in contact with skin.
H351	Suspected of causing cancer.
H372	Causes damage to organs through prolonged or repeated exposure if swallowed.
H410	Very toxic to aquatic life with long lasting effects.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust/ fume/ gas/ mist/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/ doctor. Rinse mouth.
P302 + P352 + P312	IF ON SKIN: Wash with plenty of water. Call a POISON CENTER/ doctor if you feel unwell.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

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

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Synonyms	:	1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane 1,1-Bis(4-chlorophenyl)-2,2,2-trichloroethane
Formula	:	C <sub>14</sub> H <sub>9</sub> Cl <sub>5</sub>
Molecular weight	:	354.49 g/mol
CAS-No.	:	50-29-3
EC-No.	:	200-024-3
Index-No.	:	602-045-00-7

Component	Classification	Concentration
<b>1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane</b>	Acute Tox. 3; Carc. 2; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H301, H311, H351, H372, H400, H410 M-Factor - Aquatic Acute: 100 M-Factor - Aquatic	<= 100 %

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

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## 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. 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

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## 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.

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## **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**

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

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): 6.1D: 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

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

### **8.1 Control parameters**

#### **Ingredients with workplace control parameters**

Component	CAS-No.	Value	Control parameters	Basis
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	TWA	1 mg/m <sup>3</sup>	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Confirmed animal carcinogen with unknown relevance to humans		
		TWA	0.5 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen		
		TWA	1 mg/m <sup>3</sup>	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		TWA	1 mg/m <sup>3</sup>	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		Skin notation		
		PEL	1 mg/m <sup>3</sup>	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

## 8.2 Exposure controls

### Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

### Personal protective equipment

#### Eye/face protection

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

#### Skin protection

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

#### Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

#### Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the 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**

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: 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: 107 - 110 °C (225 - 230 °F) - lit. |
| f) Initial boiling point and boiling range      | 260.0 °C 500.0 °F                                       |
| g) Flash point                                  | 72.0 - 77.0 °C (161.6 - 170.6 °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) Vapor pressure                               | 0.000 hPa at 20.0 °C (68.0 °F)                          |
| l) Vapor density                                | No data available                                       |
| m) Relative density                             | No data available                                       |
| n) Water solubility                             | No data available                                       |
| o) Partition coefficient:                       | log Pow: 6.91                                           |

n-octanol/water

- 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

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## 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

Oxidizing agents, Iron and iron salts.

### 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

LD50 Oral - Rat - 87.0 mg/kg

Remarks: (RTECS)

Inhalation: No data available

LD50 Dermal - Rabbit - 300.0 mg/kg

Remarks: Behavioral:Tremor.

Behavioral:Muscle weakness.

Behavioral:Ataxia.

(RTECS)

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**

Limited evidence of carcinogenicity in animal studies

IARC: 2A - Group 2A: Probably carcinogenic to humans (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)

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**

Ingestion - Causes damage to organs through prolonged or repeated exposure.

**Aspiration hazard**

No data available

**11.2 Additional Information**

RTECS: KJ3325000

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

Pancreas. -

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**SECTION 12: Ecological information****12.1 Toxicity**

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 0.003400 mg/l - 96.0 h Remarks: (ECOTOX Database) (Regulation (EC) No 1272/2008, Annex VI)
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 0.00108 mg/l - 48 h Remarks: (ECOTOX Database) (Regulation (EC) No 1272/2008, Annex VI)

## 12.2 Persistence and degradability

No data available

## 12.3 Bioaccumulative potential

Bioaccumulation Oncorhynchus mykiss (rainbow trout) - 20 d  
- 0.001 mg/l(1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)

Bioconcentration factor (BCF): 46,670

## 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

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## 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: 2811 Class: 6.1 Packing group: III  
Proper shipping name: Toxic solids, organic, n.o.s. (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)  
Reportable Quantity (RQ): 1 lbs  
1) 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. (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)  
Marine pollutant : yes

### IATA

UN number: 2811 Class: 6.1 Packing group: III  
Proper shipping name: Toxic solid, organic, n.o.s. (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)



## SAFETY DATA SHEET

## 1. Identification

<b>Product identifier</b>	<b>Aldrin (TM) (13C12, 99%) Solution</b>	
<b>Other means of identification</b>		
<b>Item</b>	S-FC89S	
<b>Recommended use</b>	For Laboratory Use Only	
<b>Recommended restrictions</b>	None known.	
<b>Manufacturer/Importer/Supplier/Distributor information</b>		
<b>Manufacturer</b>		
<b>Company name</b>	Chem Service, Inc.	
<b>Address</b>	660 Tower Lane West Chester, PA 19380 United States	
<b>Telephone</b>	Toll Free	800-452-9994
	Direct	610-692-3026
<b>Website</b>	www.chemservice.com	
<b>E-mail</b>	info@chemservice.com	
<b>Emergency phone number</b>	Chemtrec US	800-424-9300
	Chemtrec outside US	+1 703-527-3887

## 2. Hazard(s) identification

<b>Physical hazards</b>	Flammable liquids	Category 3
<b>Health hazards</b>	Skin corrosion/irritation	Category 2
	Serious eye damage/eye irritation	Category 2
	Specific target organ toxicity, single exposure	Category 3 narcotic effects
	Aspiration hazard	Category 1
<b>Environmental hazards</b>	Hazardous to the aquatic environment, acute hazard	Category 1
	Hazardous to the aquatic environment, long-term hazard	Category 1
<b>OSHA defined hazards</b>	Not classified.	

## Label elements



<b>Signal word</b>	Danger
<b>Hazard statement</b>	Flammable liquid and vapor. May be fatal if swallowed and enters airways. Causes skin irritation. Causes serious eye irritation. May cause drowsiness or dizziness. Very toxic to aquatic life. Very toxic to aquatic life with long lasting effects.
<b>Precautionary statement</b>	
<b>Prevention</b>	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 or vapor. Wash thoroughly after handling. Use only outdoors or in a well-ventilated area. Avoid release to the environment. Wear protective gloves/eye protection/face protection.

<b>Response</b>	If swallowed: Immediately call a poison center/doctor. Do NOT induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. If inhaled: Remove person to fresh air and keep comfortable for breathing. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a poison center/doctor if you feel unwell. If skin irritation occurs: Get medical advice/attention. If eye irritation persists: Get medical advice/attention. Take off contaminated clothing and wash before reuse. In case of fire: Use appropriate media to extinguish. Collect spillage.
<b>Storage</b>	Keep cool. Store in a well-ventilated place. Keep container tightly closed. Store locked up.
<b>Disposal</b>	Dispose of contents/container in accordance with local/regional/national/international regulations.
<b>Hazard(s) not otherwise classified (HNOC)</b>	Static accumulating flammable liquid can become electrostatically charged even in bonded and grounded equipment. Sparks may ignite liquid and vapor. May cause flash fire or explosion.
<b>Supplemental information</b>	None.

### 3. Composition/information on ingredients

#### Mixtures

Chemical name	Common name and synonyms	CAS number	%
n-Nonane		111-84-2	90 - 100
Aldrin (C1312)		Unknown	0.01

### 4. First-aid measures

<b>Inhalation</b>	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.
<b>Skin contact</b>	Take off immediately all contaminated clothing. Rinse skin with water/shower. If skin irritation occurs: Get medical advice/attention. Wash contaminated clothing before reuse.
<b>Eye contact</b>	Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if irritation develops and persists.
<b>Ingestion</b>	Call a physician or poison control center immediately. Rinse mouth. Do not induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.
<b>Most important symptoms/effects, acute and delayed</b>	Aspiration may cause pulmonary edema and pneumonitis. May cause drowsiness and dizziness. Headache. Nausea, vomiting. Severe eye irritation. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Skin irritation. May cause redness and pain.
<b>Indication of immediate medical attention and special treatment needed</b>	Provide general supportive measures and treat symptomatically. Thermal burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Keep victim under observation. Symptoms may be delayed.
<b>General information</b>	Take off all contaminated clothing immediately. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Wash contaminated clothing before reuse.

### 5. Fire-fighting measures

<b>Suitable extinguishing media</b>	Water fog. Carbon dioxide (CO <sub>2</sub> ). Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only. Alcohol resistant foam.
<b>Unsuitable extinguishing media</b>	Do not use water jet as an extinguisher, as this will spread the fire.
<b>Specific hazards arising from the chemical</b>	Vapors may form explosive mixtures with air. Vapors may travel considerable distance to a source of ignition and flash back. This product is a poor conductor of electricity and can become electrostatically charged. If sufficient charge is accumulated, ignition of flammable mixtures can occur. To reduce potential for static discharge, use proper bonding and grounding procedures. This liquid may accumulate static electricity when filling properly grounded containers. Static electricity accumulation may be significantly increased by the presence of small quantities of water or other contaminants. Material will float and may ignite on surface of water. During fire, gases hazardous to health may be formed.
<b>Special protective equipment and precautions for firefighters</b>	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
<b>Fire fighting equipment/instructions</b>	In case of fire and/or explosion do not breathe fumes. Move containers from fire area if you can do so without risk.
<b>Specific methods</b>	Use standard firefighting procedures and consider the hazards of other involved materials.
<b>General fire hazards</b>	Flammable liquid and vapor.

## 6. Accidental release measures

### Personal precautions, protective equipment and emergency procedures

Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Wear appropriate protective equipment and clothing during clean-up. Avoid breathing mist or vapor. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ventilate closed spaces before entering them. Use appropriate containment to avoid environmental contamination. Transfer by mechanical means such as vacuum truck to a salvage tank or other suitable container for recovery or safe disposal. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS. Avoid dust formation.

### Methods and materials for containment and cleaning up

Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Keep combustibles (wood, paper, oil, etc.) away from spilled material. Take precautionary measures against static discharge. Use only non-sparking tools. Prevent product from entering drains.

Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Following product recovery, flush area with water.

Small Spills: Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.

Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.

### Environmental precautions

Avoid release to the environment. Inform appropriate managerial or supervisory personnel of all environmental releases. Prevent further leakage or spillage if safe to do so. Avoid discharge into drains, water courses or onto the ground. Use appropriate containment to avoid environmental contamination.

## 7. Handling and storage

### Precautions for safe handling

Do not handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. When using do not smoke. Explosion-proof general and local exhaust ventilation. Minimize fire risks from flammable and combustible materials (including combustible dust and static accumulating liquids) or dangerous reactions with incompatible materials. Handling operations that can promote accumulation of static charges include but are not limited to: mixing, filtering, pumping at high flow rates, splash filling, creating mists or sprays, tank and container filling, tank cleaning, sampling, gauging, switch loading, vacuum truck operations. Take precautionary measures against static discharges. All equipment used when handling the product must be grounded. Use non-sparking tools and explosion-proof equipment. Avoid breathing mist or vapor. Avoid contact with eyes, skin, and clothing. Avoid prolonged exposure. Wear appropriate personal protective equipment. Wash hands thoroughly after handling. Avoid release to the environment. Observe good industrial hygiene practices.

For additional information on equipment bonding and grounding, refer to the Canadian Electrical Code in Canada, (CSA C22.1), or the American Petroleum Institute (API) Recommended Practice 2003, "Protection Against Ignitions Arising out of Static, Lightning, and Stray Currents" or National Fire Protection Association (NFPA) 77, "Recommended Practice on Static Electricity" or National Fire Protection Association (NFPA) 70, "National Electrical Code".

### Conditions for safe storage, including any incompatibilities

Store locked up. Keep away from heat, sparks and open flame. Prevent electrostatic charge build-up by using common bonding and grounding techniques. Eliminate sources of ignition. Avoid spark promoters. Ground/bond container and equipment. These alone may be insufficient to remove static electricity. Store in a cool, dry place out of direct sunlight. Store in original tightly closed container. Store in a well-ventilated place. Keep in an area equipped with sprinklers. Store away from incompatible materials (see Section 10 of the SDS).

## 8. Exposure controls/personal protection

### Occupational exposure limits

The following constituents are the only constituents of the product which have a PEL, TLV or other recommended exposure limit. At this time, the other constituents have no known exposure limits.

#### US. ACGIH Threshold Limit Values

##### Components

##### Type

##### Value

n-Nonane (CAS 111-84-2)

TWA

200 ppm

**US. NIOSH: Pocket Guide to Chemical Hazards**

<b>Components</b>	<b>Type</b>	<b>Value</b>
n-Nonane (CAS 111-84-2)	TWA	1050 mg/m <sup>3</sup> 200 ppm
<b>Biological limit values</b>	No biological exposure limits noted for the ingredient(s).	
<b>Appropriate engineering controls</b>	Explosion-proof general and local exhaust ventilation. Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Provide eyewash station. Eye wash fountain and emergency showers are recommended.	
<b>Individual protection measures, such as personal protective equipment</b>		
<b>Eye/face protection</b>	Chemical respirator with organic vapor cartridge and full facepiece.	
<b>Skin protection</b>		
<b>Hand protection</b>	Wear appropriate chemical resistant gloves.	
<b>Other</b>	Wear appropriate chemical resistant clothing.	
<b>Respiratory protection</b>	Chemical respirator with organic vapor cartridge and full facepiece.	
<b>Thermal hazards</b>	Wear appropriate thermal protective clothing, when necessary.	
<b>General hygiene considerations</b>	When using do not smoke. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.	
<b>9. Physical and chemical properties</b>		
<b>Appearance</b>		
<b>Physical state</b>	Liquid.	
<b>Form</b>	Liquid.	
<b>Color</b>	Not available.	
<b>Odor</b>	Not available.	
<b>Odor threshold</b>	Not available.	
<b>pH</b>	Not available.	
<b>Melting point/freezing point</b>	-63.4 °F (-53 °C) lit. / -64.3 °F (-53.5 °C) estimated	
<b>Initial boiling point and boiling range</b>	303.8 °F (151 °C) lit.	
<b>Flash point</b>	87.8 °F (31.0 °C) Closed Cup	
<b>Evaporation rate</b>	Not available.	
<b>Flammability (solid, gas)</b>	Not applicable.	
<b>Upper/lower flammability or explosive limits</b>		
<b>Flammability limit - lower (%)</b>	Not available.	
<b>Flammability limit - upper (%)</b>	Not available.	
<b>Explosive limit - lower (%)</b>	Not available.	
<b>Explosive limit - upper (%)</b>	Not available.	
<b>Vapor pressure</b>	5.93 hPa estimated	
<b>Vapor density</b>	Not available.	
<b>Relative density</b>	Not available.	
<b>Solubility(ies)</b>		
<b>Solubility (water)</b>	Not available.	
<b>Partition coefficient (n-octanol/water)</b>	Not available.	
<b>Auto-ignition temperature</b>	401 °F (205 °C) Cambridge	
<b>Decomposition temperature</b>	Not available.	
<b>Viscosity</b>	Not available.	

## Other information

<b>Explosive properties</b>	Not explosive.
<b>Flammability class</b>	Flammable IC estimated
<b>Molecular weight</b>	128.3 g/mol
<b>Oxidizing properties</b>	Not oxidizing.
<b>Specific gravity</b>	0.72 estimated

## 10. Stability and reactivity

<b>Reactivity</b>	The product is stable and non-reactive under normal conditions of use, storage and transport.
<b>Chemical stability</b>	Material is stable under normal conditions.
<b>Possibility of hazardous reactions</b>	Hazardous polymerization does not occur.
<b>Conditions to avoid</b>	Avoid heat, sparks, open flames and other ignition sources. Avoid temperatures exceeding the flash point. Contact with incompatible materials.
<b>Incompatible materials</b>	Strong oxidizing agents. Nitrates. Peroxides.
<b>Hazardous decomposition products</b>	No hazardous decomposition products are known.

## 11. Toxicological information

### Information on likely routes of exposure

<b>Inhalation</b>	May cause drowsiness and dizziness. Headache. Nausea, vomiting. Prolonged inhalation may be harmful.
<b>Skin contact</b>	Causes skin irritation.
<b>Eye contact</b>	Causes serious eye irritation.
<b>Ingestion</b>	Droplets of the product aspirated into the lungs through ingestion or vomiting may cause a serious chemical pneumonia.

<b>Symptoms related to the physical, chemical and toxicological characteristics</b>	Aspiration may cause pulmonary edema and pneumonitis. May cause drowsiness and dizziness. Headache. Nausea, vomiting. Severe eye irritation. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Skin irritation. May cause redness and pain.
-------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

### Information on toxicological effects

<b>Acute toxicity</b>	May be fatal if swallowed and enters airways.
-----------------------	-----------------------------------------------

<b>Components</b>	<b>Species</b>	<b>Test Results</b>
n-Nonane (CAS 111-84-2)		
<b>Acute</b>		
<b>Dermal</b>		
LD50	Rabbit	> 2000 mg/kg, 24 Hours
<b>Inhalation</b>		
<i>Vapor</i>		
LC50	Rat	17 mg/l, 4 Hours

\* Estimates for product may be based on additional component data not shown.

<b>Skin corrosion/irritation</b>	Causes skin irritation.
----------------------------------	-------------------------

<b>Serious eye damage/eye irritation</b>	Causes serious eye irritation.
------------------------------------------	--------------------------------

### Respiratory or skin sensitization

<b>Respiratory sensitization</b>	Not a respiratory sensitizer.
----------------------------------	-------------------------------

<b>Skin sensitization</b>	This product is not expected to cause skin sensitization.
---------------------------	-----------------------------------------------------------

<b>Germ cell mutagenicity</b>	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
-------------------------------	------------------------------------------------------------------------------------------------------------------

<b>Carcinogenicity</b>	Not classifiable as to carcinogenicity to humans.
------------------------	---------------------------------------------------

### IARC Monographs. Overall Evaluation of Carcinogenicity

Not listed.

### OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not regulated.

## US. National Toxicology Program (NTP) Report on Carcinogens

Not listed.

<b>Reproductive toxicity</b>	This product is not expected to cause reproductive or developmental effects.
<b>Specific target organ toxicity - single exposure</b>	May cause drowsiness and dizziness.
<b>Specific target organ toxicity - repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	May be fatal if swallowed and enters airways.
<b>Chronic effects</b>	Prolonged inhalation may be harmful.

## 12. Ecological information

<b>Ecotoxicity</b>	Very toxic to aquatic life with long lasting effects.
<b>Persistence and degradability</b>	
<b>Bioaccumulative potential</b>	
<b>Partition coefficient n-octanol / water (log Kow)</b>	
n-Nonane	5.46
<b>Mobility in soil</b>	No data available.
<b>Other adverse effects</b>	No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

## 13. Disposal considerations

<b>Disposal instructions</b>	Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national/international regulations.
<b>Local disposal regulations</b>	Dispose in accordance with all applicable regulations.
<b>Hazardous waste code</b>	The waste code should be assigned in discussion between the user, the producer and the waste disposal company.
<b>Waste from residues / unused products</b>	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
<b>Contaminated packaging</b>	Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal.

## 14. Transport information

### DOT

<b>UN number</b>	UN1920
<b>UN proper shipping name</b>	Nonanes
<b>Transport hazard class(es)</b>	
<b>Class</b>	3
<b>Subsidiary risk</b>	-
<b>Label(s)</b>	3
<b>Packing group</b>	III
<b>Special precautions for user</b>	Read safety instructions, SDS and emergency procedures before handling.
<b>Special provisions</b>	B1, IB3, T2, TP1
<b>Packaging exceptions</b>	150
<b>Packaging non bulk</b>	203
<b>Packaging bulk</b>	242

### IATA

<b>UN number</b>	UN1920
<b>UN proper shipping name</b>	Nonanes
<b>Transport hazard class(es)</b>	
<b>Class</b>	3
<b>Subsidiary risk</b>	-
<b>Packing group</b>	III
<b>Environmental hazards</b>	No.
<b>ERG Code</b>	3L
<b>Special precautions for user</b>	Read safety instructions, SDS and emergency procedures before handling.

**Other information**

**Passenger and cargo aircraft** Allowed with restrictions.  
**Cargo aircraft only** Allowed with restrictions.

**IMDG**

**UN number** UN1920  
**UN proper shipping name** NONANES  
**Transport hazard class(es)**  
**Class** 3  
**Subsidiary risk** -  
**Packing group** III  
**Environmental hazards**  
**Marine pollutant** No.  
**EmS** F-E, S-E

**Special precautions for user** Read safety instructions, SDS and emergency procedures before handling.

**Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code** Not established.

**DOT**



**IATA; IMDG**



**15. Regulatory information**

**US federal regulations** This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

**TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)**

n-Nonane (CAS 111-84-2) 1.0 % One-Time Export Notification only.

**CERCLA Hazardous Substance List (40 CFR 302.4)**

n-Nonane (CAS 111-84-2) Listed.

**SARA 304 Emergency release notification**

Not regulated.

**OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)**

Not regulated.

**Superfund Amendments and Reauthorization Act of 1986 (SARA)**

**Hazard categories** Immediate Hazard - Yes  
Delayed Hazard - No  
Fire Hazard - Yes  
Pressure Hazard - No  
Reactivity Hazard - No

**SARA 302 Extremely hazardous substance**

Not listed.

**SARA 311/312 Hazardous chemical** No**SARA 313 (TRI reporting)**  
Not regulated.**Other federal regulations****Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List**

Not regulated.

**Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)**

Not regulated.

**Safe Drinking Water Act (SDWA)** Not regulated.**US state regulations**

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

**International Inventories**

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	No
Canada	Domestic Substances List (DSL)	No
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	No
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	No
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	No
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	No

\*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

**16. Other information, including date of preparation or last revision**

**Issue date** 07-11-2014  
**Revision date** 06-05-2018  
**Version #** 03  
**NFPA ratings** Health: 2  
 Flammability: 3  
 Instability: 0



**Disclaimer**

The above information is believed to be correct on the date it was last revised and must not be considered all inclusive. The information has been obtained only by a search of available literature and is only a guide for handling the chemicals. OSHA regulations require that if other hazards become evident, an upgraded SDS must be made available to the employee within three months. RESPONSIBILITY for updates lies with the employer and not with CHEM SERVICE, Inc.

Persons not specifically and properly trained should not handle this chemical or its container. This product is furnished FOR LABORATORY USE ONLY! Our products may NOT BE USED as drugs, cosmetics, agricultural or pesticide products, food additives or as household chemicals.

This Safety Data Sheet (SDS) is intended only for use with Chem Service, Inc. products and should not be relied on for use with materials from any other supplier even if the chemical name(s) on the product are identical! Whenever using an SDS for a solution or mixture the user should refer to the SDS for every component of the solution or mixture. Chem Service warrants that this SDS is based upon the most current information available to Chem Service at the time it was last revised. THIS WARRANTY IS EXCLUSIVE, AND CHEM SERVICE, INC. MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. This SDS is provided gratis and CHEM SERVICE, INC. SHALL NOT BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR CONTINGENT DAMAGES.

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This product is furnished FOR LABORATORY USE ONLY.

This document has undergone significant changes and should be reviewed in its entirety.

**Revision information**

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**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, Chronic Health Hazard

**Massachusetts Right To Know Components**

	CAS-No.	Revision Date
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	1993-02-16

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

**Pennsylvania Right To Know Components**

	CAS-No.	Revision Date
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	1993-02-16

	CAS-No.	Revision Date
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	1993-02-16

**New Jersey Right To Know Components**

	CAS-No.	Revision Date
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	1993-02-16

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**SECTION 16: Other information****Further information**

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](http://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](mailto:mlsbranding@sial.com).

Version: 6.3

Revision Date: 04/18/2021

Print Date: 09/11/2021

## SAFETY DATA SHEET

Version 8.1  
Revision Date 04/17/2021  
Print Date 09/14/2021

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name :  $\alpha$ -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 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 3), H301  
Acute toxicity, Dermal (Category 4), H312  
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 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

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Synonyms	: $\alpha$ -1,2,3,4,5,6-Hexachlorocyclohexane
Formula	: C <sub>6</sub> H <sub>6</sub> Cl <sub>6</sub>
Molecular weight	: 290.83 g/mol
CAS-No.	: 319-84-6
EC-No.	: 206-270-8
Index-No.	: 602-042-00-0

Component	Classification	Concentration
<b>(1<math>\alpha</math>,2<math>\alpha</math>,3<math>\beta</math>,4<math>\alpha</math>,5<math>\beta</math>,6<math>\beta</math>)-1,2,3,4,5,6-Hexachlorocyclohexane</b>		
	Acute Tox. 3; Acute Tox. 4; Carc. 2; Aquatic Acute 1; Aquatic Chronic 1; H301, H312, H351, H400, H410 M-Factor - Aquatic Acute: 10	<= 100 %

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

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## 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. 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**

#### **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**

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

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): 6.1D: 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

---

## **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**

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.

---

## **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                 | 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) 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: 3.80                       |
| 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

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 sensitization

No data available

#### Germ cell mutagenicity

No data available

#### Carcinogenicity

Supelco - 48493

Page 6 of 10

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 ((1 $\alpha$ ,2 $\alpha$ ,3 $\beta$ ,4 $\alpha$ ,5 $\beta$ ,6 $\beta$ )-1,2,3,4,5,6-Hexachlorocyclohexane)

IARC: 2B - Group 2B: Possibly carcinogenic to humans ((1 $\alpha$ ,2 $\alpha$ ,3 $\beta$ ,4 $\alpha$ ,5 $\beta$ ,6 $\beta$ )-1,2,3,4,5,6-Hexachlorocyclohexane)

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: RAHC - Reasonably anticipated to be a human carcinogen ((1 $\alpha$ ,2 $\alpha$ ,3 $\beta$ ,4 $\alpha$ ,5 $\beta$ ,6 $\beta$ )-1,2,3,4,5,6-Hexachlorocyclohexane)

NTP: RAHC - Reasonably anticipated to be a human carcinogen ((1 $\alpha$ ,2 $\alpha$ ,3 $\beta$ ,4 $\alpha$ ,5 $\beta$ ,6 $\beta$ )-1,2,3,4,5,6-Hexachlorocyclohexane)

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

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

### **11.2 Additional Information**

RTECS: GV3500000

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 - 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((1 $\alpha$ ,2 $\alpha$ ,3 $\beta$ ,4 $\alpha$ ,5 $\beta$ ,6 $\beta$ )-1,2,3,4,5,6-Hexachlorocyclohexane)

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.

---

## 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: 2811 Class: 6.1 Packing group: III  
Proper shipping name: Toxic solids, organic, n.o.s. ((1 $\alpha$ ,2 $\alpha$ ,3 $\beta$ ,4 $\alpha$ ,5 $\beta$ ,6 $\beta$ )-1,2,3,4,5,6-Hexachlorocyclohexane)  
Reportable Quantity (RQ): 10 lbs

1) 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. ((1 $\alpha$ ,2 $\alpha$ ,3 $\beta$ ,4 $\alpha$ ,5 $\beta$ ,6 $\beta$ )-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. ((1 $\alpha$ ,2 $\alpha$ ,3 $\beta$ ,4 $\alpha$ ,5 $\beta$ ,6 $\beta$ )-1,2,3,4,5,6-Hexachlorocyclohexane)

---

**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**

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
(1 $\alpha$ ,2 $\alpha$ ,3 $\beta$ ,4 $\alpha$ ,5 $\beta$ ,6 $\beta$ )-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
(1 $\alpha$ ,2 $\alpha$ ,3 $\beta$ ,4 $\alpha$ ,5 $\beta$ ,6 $\beta$ )-1,2,3,4,5,6-Hexachlorocyclohexane	319-84-6	2007-07-01

**Pennsylvania Right To Know Components**

	CAS-No.	Revision Date
(1 $\alpha$ ,2 $\alpha$ ,3 $\beta$ ,4 $\alpha$ ,5 $\beta$ ,6 $\beta$ )-1,2,3,4,5,6-Hexachlorocyclohexane	319-84-6	2007-07-01

**California Prop. 65 Components**

	CAS-No.	Revision Date
, which is/are known to the State of California to cause cancer. For more information go to <a href="http://www.P65Warnings.ca.gov">www.P65Warnings.ca.gov</a> . (1 $\alpha$ ,2 $\alpha$ ,3 $\beta$ ,4 $\alpha$ ,5 $\beta$ ,6 $\beta$ )-1,2,3,4,5,6-Hexachlorocyclohexane	319-84-6	2009-02-01

	CAS-No.	Revision Date
WARNING! This product contains a chemical known in the State of California to cause cancer. (1 $\alpha$ ,2 $\alpha$ ,3 $\beta$ ,4 $\alpha$ ,5 $\beta$ ,6 $\beta$ )-1,2,3,4,5,6-Hexachlorocyclohexane	319-84-6	2009-02-01

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**SECTION 16: Other information****Further information**

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](http://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: 8.1

Revision Date: 04/17/2021

Print Date: 09/14/2021

## 1. Identification

<b>Product identifier</b>	<b>cis-Chlordane</b>	
<b>Other means of identification</b>		
<b>Product code</b>	N-11480	
<b>Synonym(s)</b>	alpha Chlordane	
<b>Recommended use</b>	For Laboratory Use Only	
<b>Recommended restrictions</b>	None known.	
<b>Manufacturer/Importer/Supplier/Distributor information</b>		
<b>Manufacturer</b>		
<b>Company name</b>	Chem Service, Inc.	
<b>Address</b>	660 Tower Lane West Chester, PA 19380 United States	
<b>Telephone</b>	Toll Free	800-452-9994
	Direct	610-692-3026
<b>Website</b>	www.chemservice.com	
<b>E-mail</b>	info@chemservice.com	
<b>Emergency phone number</b>	Chemtrec US	800-424-9300
	Chemtrec outside US	+1 703-527-3887

## 2. Hazard(s) identification

<b>Physical hazards</b>	Not classified.	
<b>Health hazards</b>	Acute toxicity, oral	Category 3
	Acute toxicity, dermal	Category 3
	Acute toxicity, inhalation	Category 2
	Carcinogenicity	Category 2
	Reproductive toxicity	Category 2
<b>Environmental hazards</b>	Hazardous to the aquatic environment, acute hazard	Category 1
	Hazardous to the aquatic environment, long-term hazard	Category 1
<b>OSHA defined hazards</b>	Not classified.	
<b>Label elements</b>		



<b>Signal word</b>	Danger
<b>Hazard statement</b>	Toxic if swallowed. Toxic in contact with skin. Fatal if inhaled. Suspected of causing cancer. Suspected of damaging fertility or the unborn child. Very toxic to aquatic life. Very toxic to aquatic life with long lasting effects.
<b>Precautionary statement</b>	
<b>Prevention</b>	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use only outdoors or in a well-ventilated area. Do not breathe dust/fume. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Avoid release to the environment. Wear protective gloves/protective clothing/eye protection/face protection. Wear respiratory protection.
<b>Response</b>	If swallowed: Immediately call a poison center/doctor. If on skin: Wash with plenty of water. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center/doctor. Specific treatment is urgent (see this label). Rinse mouth. Take off immediately all contaminated clothing and wash it before reuse. Collect spillage.
<b>Storage</b>	Store in a well-ventilated place. Keep container tightly closed. Store locked up.
<b>Disposal</b>	Dispose of contents/container in accordance with local/regional/national/international regulations.
<b>Hazard(s) not otherwise classified (HNOC)</b>	None known.

### 3. Composition/information on ingredients

#### Substances

Chemical name	Common name and synonyms	CAS number	%
cis-Chlordane	alpha Chlordane	5103-71-9	100

\*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

### 4. First-aid measures

#### Inhalation

Remove victim to fresh air and keep at rest in a position comfortable for breathing. Oxygen or artificial respiration if needed. Do not use mouth-to-mouth method if victim inhaled the substance. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Call a physician or poison control center immediately.

#### Skin contact

Take off immediately all contaminated clothing. Wash off with soap and plenty of water. Call a POISON CENTER or doctor/physician if you feel unwell. Get medical attention if irritation develops and persists.

#### Eye contact

Do not rub eyes. Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if irritation develops and persists.

#### Ingestion

Call a physician or poison control center immediately. Rinse mouth. Do not induce vomiting without advice from poison control center. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Do not use mouth-to-mouth method if victim ingested the substance. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.

#### Most important symptoms/effects, acute and delayed

Direct contact with eyes may cause temporary irritation.

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

Provide general supportive measures and treat symptomatically. In case of shortness of breath, give oxygen. Keep victim warm. Keep victim under observation. Symptoms may be delayed.

#### General information

Take off immediately all contaminated clothing. IF exposed or concerned: Get medical advice/attention. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance. Wash contaminated clothing before reuse.

### 5. Fire-fighting measures

#### Suitable extinguishing media

Alcohol resistant foam. Water fog. Dry chemical powder. Carbon dioxide (CO<sub>2</sub>).

#### Unsuitable extinguishing media

Do not use water jet as an extinguisher, as this will spread the fire.

#### Specific hazards arising from the chemical

During fire, gases hazardous to health may be formed.

#### Special protective equipment and precautions for firefighters

Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

#### Fire-fighting equipment/instructions

Use water spray to cool unopened containers.

#### Specific methods

Use standard firefighting procedures and consider the hazards of other involved materials.

#### General fire hazards

No unusual fire or explosion hazards noted.

### 6. Accidental release measures

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

Immediately evacuate personnel to safe areas. Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Keep out of low areas. Wear appropriate protective equipment and clothing during clean-up. Do not breathe dust. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ventilate closed spaces before entering them. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.

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

Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). This material is classified as a water pollutant under the Clean Water Act and should be prevented from contaminating soil or from entering sewage and drainage systems which lead to waterways. Stop the flow of material, if this is without risk. Collect spillage.

Large Spills: Wet down with water and dike for later disposal. Following product recovery, flush area with water.

Small Spills: Sweep up or vacuum up spillage and collect in suitable container for disposal.

Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.

**Environmental precautions** Avoid release to the environment. Contact local authorities in case of spillage to drain/aquatic environment. Prevent further leakage or spillage if safe to do so. Do not contaminate water. Avoid discharge into drains, water courses or onto the ground.

## 7. Handling and storage

**Precautions for safe handling** Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Minimize dust generation and accumulation. Do not breathe dust. Do not taste or swallow. Avoid contact with skin. Avoid contact with eyes. Avoid contact during pregnancy/while nursing. Avoid prolonged exposure. Avoid contact with clothing. Use only outdoors or in a well-ventilated area. Wear appropriate personal protective equipment. Observe good industrial hygiene practices. When using, do not eat, drink or smoke. Wash hands thoroughly after handling. Wash contaminated clothing before reuse. Avoid release to the environment. Do not empty into drains.

**Conditions for safe storage, including any incompatibilities** Store locked up. Store in original tightly closed container. Store in a well-ventilated place. Store away from incompatible materials (see Section 10 of the SDS).

## 8. Exposure controls/personal protection

### Occupational exposure limits

#### US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Material	Type	Value
cis-Chlordane (CAS 5103-71-9)	PEL	0.5 mg/m3

#### US. ACGIH Threshold Limit Values

Material	Type	Value
cis-Chlordane (CAS 5103-71-9)	TWA	0.5 mg/m3

#### US. NIOSH: Pocket Guide to Chemical Hazards

Material	Type	Value
cis-Chlordane (CAS 5103-71-9)	TWA	0.5 mg/m3

**Biological limit values** No biological exposure limits noted for the ingredient(s).

### Exposure guidelines

#### US - California OELs: Skin designation

cis-Chlordane (CAS 5103-71-9) Can be absorbed through the skin.

#### US - Minnesota Haz Subs: Skin designation applies

cis-Chlordane (CAS 5103-71-9) Skin designation applies.

#### US - Tennessee OELs: Skin designation

cis-Chlordane (CAS 5103-71-9) Can be absorbed through the skin.

#### US ACGIH Threshold Limit Values: Skin designation

cis-Chlordane (CAS 5103-71-9) Can be absorbed through the skin.

#### US NIOSH Pocket Guide to Chemical Hazards: Skin designation

cis-Chlordane (CAS 5103-71-9) Can be absorbed through the skin.

#### US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

cis-Chlordane (CAS 5103-71-9) Can be absorbed through the skin.

**Appropriate engineering controls** Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

### Individual protection measures, such as personal protective equipment

**Eye/face protection** Wear eye/face protection. Wear safety glasses with side shields (or goggles).

#### Skin protection

**Hand protection** Wear protective gloves.

**Other** Wear appropriate chemical resistant clothing.

**Respiratory protection** Wear positive pressure self-contained breathing apparatus (SCBA).

**Thermal hazards** Wear appropriate thermal protective clothing, when necessary.

**General hygiene considerations** When using, do not eat, drink or smoke. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

## 9. Physical and chemical properties

### Appearance



<b>Physical state</b>	Solid.
<b>Form</b>	Solid. Crystalline Solid
<b>Color</b>	White
<b>Odor</b>	Not available.
<b>Odor threshold</b>	Not available.
<b>pH</b>	Not available.
<b>Melting point/freezing point</b>	222.8 - 224.6 °F (106 - 107 °C)
<b>Initial boiling point and boiling range</b>	347 °F (175 °C) 0.133322 kPa
<b>Flash point</b>	225.0 °F (107.2 °C) Open Cup
<b>Evaporation rate</b>	Not available.
<b>Flammability (solid, gas)</b>	Not available.
<b>Upper/lower flammability or explosive limits</b>	
<b>Flammability limit - lower (%)</b>	Not available.
<b>Flammability limit - upper (%)</b>	Not available.
<b>Explosive limit - lower (%)</b>	Not available.
<b>Explosive limit - upper (%)</b>	Not available.
<b>Vapor pressure</b>	0 kPa at 25 °C
<b>Vapor density</b>	14
<b>Relative density</b>	Not available.
<b>Solubility(ies)</b>	
<b>Solubility (water)</b>	0 g/l
<b>Partition coefficient (n-octanol/water)</b>	5.2
<b>Auto-ignition temperature</b>	Not available.
<b>Decomposition temperature</b>	Not available.
<b>Viscosity</b>	Not available.
<b>Other information</b>	
<b>Density</b>	1.59 g/ml
<b>Flammability class</b>	Combustible IIIB estimated
<b>Molecular formula</b>	C10-H6-Cl8
<b>Molecular weight</b>	409.8 g/mol
<b>Specific gravity</b>	1.59 - 1.63 at 25 °C

## 10. Stability and reactivity

<b>Reactivity</b>	The product is stable and non-reactive under normal conditions of use, storage and transport.
<b>Chemical stability</b>	Material is stable under normal conditions.
<b>Possibility of hazardous reactions</b>	Hazardous polymerization does not occur.
<b>Conditions to avoid</b>	Avoid temperatures exceeding the flash point. Contact with incompatible materials.
<b>Incompatible materials</b>	Strong oxidizing agents.
<b>Hazardous decomposition products</b>	No hazardous decomposition products are known.

## 11. Toxicological information

### Information on likely routes of exposure

<b>Ingestion</b>	Toxic if swallowed.
<b>Inhalation</b>	Fatal if inhaled.
<b>Skin contact</b>	Toxic in contact with skin.
<b>Eye contact</b>	Direct contact with eyes may cause temporary irritation.
<b>Symptoms related to the physical, chemical and toxicological characteristics</b>	Direct contact with eyes may cause temporary irritation.

### Information on toxicological effects

**Acute toxicity** Fatal if inhaled. Toxic if swallowed. Toxic in contact with skin.

<b>Product</b>	<b>Species</b>	<b>Test Results</b>
cis-Chlordane (CAS 5103-71-9)		
<b>Acute</b>		
<i>Dermal</i>		
LD50	Rat	590 - 840 mg/kg
<i>Inhalation</i>		
LC50	Cat	0.1 mg/l, 4 Hours
<i>Oral</i>		
LD50	Mouse	430 mg/kg
	Rabbit	300 mg/kg
	Rat	590 mg/kg
TD	Rat	25 mg/kg
<i>Other</i>		
LD50	Rat	343 mg/kg

\* Estimates for product may be based on additional component data not shown.

**Skin corrosion/irritation** Prolonged skin contact may cause temporary irritation.

**Serious eye damage/eye irritation** Direct contact with eyes may cause temporary irritation.

**Respiratory or skin sensitization**

**Respiratory sensitization** Not available.

**Skin sensitization** This product is not expected to cause skin sensitization.

**Germ cell mutagenicity** No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

**Carcinogenicity** Suspected of causing cancer.

**IARC Monographs. Overall Evaluation of Carcinogenicity**

cis-Chlordane (CAS 5103-71-9) 2B Possibly carcinogenic to humans.

**US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)**

Not listed.

**Reproductive toxicity** Suspected of damaging fertility or the unborn child.

**Specific target organ toxicity - single exposure** Not classified.

**Specific target organ toxicity - repeated exposure** Not classified.

**Aspiration hazard** Not available.

**Chronic effects** Prolonged inhalation may be harmful. Prolonged exposure may cause chronic effects.

**12. Ecological information**

**Ecotoxicity** Very toxic to aquatic life with long lasting effects. Accumulation in aquatic organisms is expected.

<b>Product</b>	<b>Species</b>	<b>Test Results</b>
cis-Chlordane (CAS 5103-71-9)		
<b>Aquatic</b>		
Fish	LC50 Bluegill ( <i>Lepomis macrochirus</i> )	0.0043 - 0.0118 mg/l, 96 hours

\* Estimates for product may be based on additional component data not shown.

**Persistence and degradability** No data is available on the degradability of this product.

**Bioaccumulative potential** Not available.

**Partition coefficient n-octanol / water (log Kow)**

5.16

**Mobility in soil** No data available.

**Other adverse effects** No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

### 13. Disposal considerations

<b>Disposal instructions</b>	Collect and reclaim or dispose in sealed containers at licensed waste disposal site. This material and its container must be disposed of as hazardous waste. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national/international regulations.
<b>Local disposal regulations</b>	Dispose in accordance with all applicable regulations.
<b>Hazardous waste code</b>	The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

#### US RCRA Hazardous Waste U List: Reference

cis-Chlordane (CAS 5103-71-9) U036

<b>Waste from residues / unused products</b>	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
<b>Contaminated packaging</b>	Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

### 14. Transport information

#### DOT

<b>UN number</b>	UN2811
<b>UN proper shipping name</b>	Toxic solids, organic, n.o.s. (cis-Chlordane), MARINE POLLUTANT
<b>Transport hazard class(es)</b>	
<b>Class</b>	6.1(PGIII)
<b>Subsidiary risk</b>	-
<b>Label(s)</b>	6.1
<b>Packing group</b>	III
<b>Environmental hazards</b>	
<b>Marine pollutant</b>	Yes
<b>Special precautions for user</b>	Read safety instructions, SDS and emergency procedures before handling.
<b>Special provisions</b>	IB8, IP3, T1, TP33
<b>Packaging exceptions</b>	153
<b>Packaging non bulk</b>	213
<b>Packaging bulk</b>	240

#### IATA

<b>UN number</b>	UN2811
<b>UN proper shipping name</b>	Toxic solid, organic, n.o.s. (cis-Chlordane)
<b>Transport hazard class(es)</b>	
<b>Class</b>	6.1(PGIII)
<b>Subsidiary risk</b>	-
<b>Packing group</b>	III
<b>Environmental hazards</b>	No.
<b>ERG Code</b>	6L
<b>Special precautions for user</b>	Read safety instructions, SDS and emergency procedures before handling.
<b>Other information</b>	
<b>Passenger and cargo aircraft</b>	Allowed.
<b>Cargo aircraft only</b>	Allowed.

#### IMDG

<b>UN number</b>	UN2811
<b>UN proper shipping name</b>	TOXIC SOLID, ORGANIC, N.O.S. (cis-Chlordane), MARINE POLLUTANT
<b>Transport hazard class(es)</b>	
<b>Class</b>	6.1(PGIII)
<b>Subsidiary risk</b>	-
<b>Packing group</b>	III
<b>Environmental hazards</b>	
<b>Marine pollutant</b>	Yes
<b>EmS</b>	F-A, S-A
<b>Special precautions for user</b>	Read safety instructions, SDS and emergency procedures before handling.

**Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code** Not applicable.

## 1. Identification

<b>Product identifier</b>	<b>cis-Chlordane</b>	
<b>Other means of identification</b>		
<b>Product code</b>	N-11480	
<b>Synonym(s)</b>	alpha Chlordane	
<b>Recommended use</b>	For Laboratory Use Only	
<b>Recommended restrictions</b>	None known.	
<b>Manufacturer/Importer/Supplier/Distributor information</b>		
<b>Manufacturer</b>		
<b>Company name</b>	Chem Service, Inc.	
<b>Address</b>	660 Tower Lane West Chester, PA 19380 United States	
<b>Telephone</b>	Toll Free	800-452-9994
	Direct	610-692-3026
<b>Website</b>	www.chemservice.com	
<b>E-mail</b>	info@chemservice.com	
<b>Emergency phone number</b>	Chemtrec US	800-424-9300
	Chemtrec outside US	+1 703-527-3887

## 2. Hazard(s) identification

<b>Physical hazards</b>	Not classified.	
<b>Health hazards</b>	Acute toxicity, oral	Category 3
	Acute toxicity, dermal	Category 3
	Acute toxicity, inhalation	Category 2
	Carcinogenicity	Category 2
	Reproductive toxicity	Category 2
<b>Environmental hazards</b>	Hazardous to the aquatic environment, acute hazard	Category 1
	Hazardous to the aquatic environment, long-term hazard	Category 1
<b>OSHA defined hazards</b>	Not classified.	
<b>Label elements</b>		



<b>Signal word</b>	Danger
<b>Hazard statement</b>	Toxic if swallowed. Toxic in contact with skin. Fatal if inhaled. Suspected of causing cancer. Suspected of damaging fertility or the unborn child. Very toxic to aquatic life. Very toxic to aquatic life with long lasting effects.
<b>Precautionary statement</b>	
<b>Prevention</b>	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use only outdoors or in a well-ventilated area. Do not breathe dust/fume. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Avoid release to the environment. Wear protective gloves/protective clothing/eye protection/face protection. Wear respiratory protection.
<b>Response</b>	If swallowed: Immediately call a poison center/doctor. If on skin: Wash with plenty of water. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center/doctor. Specific treatment is urgent (see this label). Rinse mouth. Take off immediately all contaminated clothing and wash it before reuse. Collect spillage.
<b>Storage</b>	Store in a well-ventilated place. Keep container tightly closed. Store locked up.
<b>Disposal</b>	Dispose of contents/container in accordance with local/regional/national/international regulations.
<b>Hazard(s) not otherwise classified (HNOC)</b>	None known.

### 3. Composition/information on ingredients

#### Substances

Chemical name	Common name and synonyms	CAS number	%
cis-Chlordane	alpha Chlordane	5103-71-9	100

\*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

### 4. First-aid measures

#### Inhalation

Remove victim to fresh air and keep at rest in a position comfortable for breathing. Oxygen or artificial respiration if needed. Do not use mouth-to-mouth method if victim inhaled the substance. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Call a physician or poison control center immediately.

#### Skin contact

Take off immediately all contaminated clothing. Wash off with soap and plenty of water. Call a POISON CENTER or doctor/physician if you feel unwell. Get medical attention if irritation develops and persists.

#### Eye contact

Do not rub eyes. Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if irritation develops and persists.

#### Ingestion

Call a physician or poison control center immediately. Rinse mouth. Do not induce vomiting without advice from poison control center. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Do not use mouth-to-mouth method if victim ingested the substance. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.

#### Most important symptoms/effects, acute and delayed

Direct contact with eyes may cause temporary irritation.

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

Provide general supportive measures and treat symptomatically. In case of shortness of breath, give oxygen. Keep victim warm. Keep victim under observation. Symptoms may be delayed.

#### General information

Take off immediately all contaminated clothing. IF exposed or concerned: Get medical advice/attention. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance. Wash contaminated clothing before reuse.

### 5. Fire-fighting measures

#### Suitable extinguishing media

Alcohol resistant foam. Water fog. Dry chemical powder. Carbon dioxide (CO<sub>2</sub>).

#### Unsuitable extinguishing media

Do not use water jet as an extinguisher, as this will spread the fire.

#### Specific hazards arising from the chemical

During fire, gases hazardous to health may be formed.

#### Special protective equipment and precautions for firefighters

Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

#### Fire-fighting equipment/instructions

Use water spray to cool unopened containers.

#### Specific methods

Use standard firefighting procedures and consider the hazards of other involved materials.

#### General fire hazards

No unusual fire or explosion hazards noted.

### 6. Accidental release measures

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

Immediately evacuate personnel to safe areas. Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Keep out of low areas. Wear appropriate protective equipment and clothing during clean-up. Do not breathe dust. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ventilate closed spaces before entering them. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.

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

Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). This material is classified as a water pollutant under the Clean Water Act and should be prevented from contaminating soil or from entering sewage and drainage systems which lead to waterways. Stop the flow of material, if this is without risk. Collect spillage.

Large Spills: Wet down with water and dike for later disposal. Following product recovery, flush area with water.

Small Spills: Sweep up or vacuum up spillage and collect in suitable container for disposal.

Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.

**Environmental precautions** Avoid release to the environment. Contact local authorities in case of spillage to drain/aquatic environment. Prevent further leakage or spillage if safe to do so. Do not contaminate water. Avoid discharge into drains, water courses or onto the ground.

## 7. Handling and storage

**Precautions for safe handling** Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Minimize dust generation and accumulation. Do not breathe dust. Do not taste or swallow. Avoid contact with skin. Avoid contact with eyes. Avoid contact during pregnancy/while nursing. Avoid prolonged exposure. Avoid contact with clothing. Use only outdoors or in a well-ventilated area. Wear appropriate personal protective equipment. Observe good industrial hygiene practices. When using, do not eat, drink or smoke. Wash hands thoroughly after handling. Wash contaminated clothing before reuse. Avoid release to the environment. Do not empty into drains.

**Conditions for safe storage, including any incompatibilities** Store locked up. Store in original tightly closed container. Store in a well-ventilated place. Store away from incompatible materials (see Section 10 of the SDS).

## 8. Exposure controls/personal protection

### Occupational exposure limits

#### US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Material	Type	Value
cis-Chlordane (CAS 5103-71-9)	PEL	0.5 mg/m3

#### US. ACGIH Threshold Limit Values

Material	Type	Value
cis-Chlordane (CAS 5103-71-9)	TWA	0.5 mg/m3

#### US. NIOSH: Pocket Guide to Chemical Hazards

Material	Type	Value
cis-Chlordane (CAS 5103-71-9)	TWA	0.5 mg/m3

**Biological limit values** No biological exposure limits noted for the ingredient(s).

### Exposure guidelines

#### US - California OELs: Skin designation

cis-Chlordane (CAS 5103-71-9) Can be absorbed through the skin.

#### US - Minnesota Haz Subs: Skin designation applies

cis-Chlordane (CAS 5103-71-9) Skin designation applies.

#### US - Tennessee OELs: Skin designation

cis-Chlordane (CAS 5103-71-9) Can be absorbed through the skin.

#### US ACGIH Threshold Limit Values: Skin designation

cis-Chlordane (CAS 5103-71-9) Can be absorbed through the skin.

#### US NIOSH Pocket Guide to Chemical Hazards: Skin designation

cis-Chlordane (CAS 5103-71-9) Can be absorbed through the skin.

#### US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

cis-Chlordane (CAS 5103-71-9) Can be absorbed through the skin.

**Appropriate engineering controls** Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

### Individual protection measures, such as personal protective equipment

**Eye/face protection** Wear eye/face protection. Wear safety glasses with side shields (or goggles).

#### Skin protection

**Hand protection** Wear protective gloves.

**Other** Wear appropriate chemical resistant clothing.

**Respiratory protection** Wear positive pressure self-contained breathing apparatus (SCBA).

**Thermal hazards** Wear appropriate thermal protective clothing, when necessary.

**General hygiene considerations** When using, do not eat, drink or smoke. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

## 9. Physical and chemical properties

### Appearance

<b>Physical state</b>	Solid.
<b>Form</b>	Solid. Crystalline Solid
<b>Color</b>	White
<b>Odor</b>	Not available.
<b>Odor threshold</b>	Not available.
<b>pH</b>	Not available.
<b>Melting point/freezing point</b>	222.8 - 224.6 °F (106 - 107 °C)
<b>Initial boiling point and boiling range</b>	347 °F (175 °C) 0.133322 kPa
<b>Flash point</b>	225.0 °F (107.2 °C) Open Cup
<b>Evaporation rate</b>	Not available.
<b>Flammability (solid, gas)</b>	Not available.
<b>Upper/lower flammability or explosive limits</b>	
<b>Flammability limit - lower (%)</b>	Not available.
<b>Flammability limit - upper (%)</b>	Not available.
<b>Explosive limit - lower (%)</b>	Not available.
<b>Explosive limit - upper (%)</b>	Not available.
<b>Vapor pressure</b>	0 kPa at 25 °C
<b>Vapor density</b>	14
<b>Relative density</b>	Not available.
<b>Solubility(ies)</b>	
<b>Solubility (water)</b>	0 g/l
<b>Partition coefficient (n-octanol/water)</b>	5.2
<b>Auto-ignition temperature</b>	Not available.
<b>Decomposition temperature</b>	Not available.
<b>Viscosity</b>	Not available.
<b>Other information</b>	
<b>Density</b>	1.59 g/ml
<b>Flammability class</b>	Combustible IIIB estimated
<b>Molecular formula</b>	C10-H6-Cl8
<b>Molecular weight</b>	409.8 g/mol
<b>Specific gravity</b>	1.59 - 1.63 at 25 °C

## 10. Stability and reactivity

<b>Reactivity</b>	The product is stable and non-reactive under normal conditions of use, storage and transport.
<b>Chemical stability</b>	Material is stable under normal conditions.
<b>Possibility of hazardous reactions</b>	Hazardous polymerization does not occur.
<b>Conditions to avoid</b>	Avoid temperatures exceeding the flash point. Contact with incompatible materials.
<b>Incompatible materials</b>	Strong oxidizing agents.
<b>Hazardous decomposition products</b>	No hazardous decomposition products are known.

## 11. Toxicological information

### Information on likely routes of exposure

<b>Ingestion</b>	Toxic if swallowed.
<b>Inhalation</b>	Fatal if inhaled.
<b>Skin contact</b>	Toxic in contact with skin.
<b>Eye contact</b>	Direct contact with eyes may cause temporary irritation.
<b>Symptoms related to the physical, chemical and toxicological characteristics</b>	Direct contact with eyes may cause temporary irritation.

### Information on toxicological effects

**Acute toxicity** Fatal if inhaled. Toxic if swallowed. Toxic in contact with skin.

<b>Product</b>	<b>Species</b>	<b>Test Results</b>
cis-Chlordane (CAS 5103-71-9)		
<b>Acute</b>		
<i>Dermal</i>		
LD50	Rat	590 - 840 mg/kg
<i>Inhalation</i>		
LC50	Cat	0.1 mg/l, 4 Hours
<i>Oral</i>		
LD50	Mouse	430 mg/kg
	Rabbit	300 mg/kg
	Rat	590 mg/kg
TD	Rat	25 mg/kg
<i>Other</i>		
LD50	Rat	343 mg/kg

\* Estimates for product may be based on additional component data not shown.

**Skin corrosion/irritation** Prolonged skin contact may cause temporary irritation.

**Serious eye damage/eye irritation** Direct contact with eyes may cause temporary irritation.

**Respiratory or skin sensitization**

**Respiratory sensitization** Not available.

**Skin sensitization** This product is not expected to cause skin sensitization.

**Germ cell mutagenicity** No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

**Carcinogenicity** Suspected of causing cancer.

**IARC Monographs. Overall Evaluation of Carcinogenicity**

cis-Chlordane (CAS 5103-71-9) 2B Possibly carcinogenic to humans.

**US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)**

Not listed.

**Reproductive toxicity** Suspected of damaging fertility or the unborn child.

**Specific target organ toxicity - single exposure** Not classified.

**Specific target organ toxicity - repeated exposure** Not classified.

**Aspiration hazard** Not available.

**Chronic effects** Prolonged inhalation may be harmful. Prolonged exposure may cause chronic effects.

**12. Ecological information**

**Ecotoxicity** Very toxic to aquatic life with long lasting effects. Accumulation in aquatic organisms is expected.

<b>Product</b>	<b>Species</b>	<b>Test Results</b>
cis-Chlordane (CAS 5103-71-9)		
<b>Aquatic</b>		
Fish	LC50 Bluegill ( <i>Lepomis macrochirus</i> )	0.0043 - 0.0118 mg/l, 96 hours

\* Estimates for product may be based on additional component data not shown.

**Persistence and degradability** No data is available on the degradability of this product.

**Bioaccumulative potential** Not available.

**Partition coefficient n-octanol / water (log Kow)**

5.16

**Mobility in soil** No data available.

**Other adverse effects** No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.



### 13. Disposal considerations

<b>Disposal instructions</b>	Collect and reclaim or dispose in sealed containers at licensed waste disposal site. This material and its container must be disposed of as hazardous waste. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national/international regulations.
<b>Local disposal regulations</b>	Dispose in accordance with all applicable regulations.
<b>Hazardous waste code</b>	The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

#### US RCRA Hazardous Waste U List: Reference

cis-Chlordane (CAS 5103-71-9) U036

<b>Waste from residues / unused products</b>	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
<b>Contaminated packaging</b>	Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

### 14. Transport information

#### DOT

<b>UN number</b>	UN2811
<b>UN proper shipping name</b>	Toxic solids, organic, n.o.s. (cis-Chlordane), MARINE POLLUTANT
<b>Transport hazard class(es)</b>	
<b>Class</b>	6.1(PGIII)
<b>Subsidiary risk</b>	-
<b>Label(s)</b>	6.1
<b>Packing group</b>	III
<b>Environmental hazards</b>	
<b>Marine pollutant</b>	Yes
<b>Special precautions for user</b>	Read safety instructions, SDS and emergency procedures before handling.
<b>Special provisions</b>	IB8, IP3, T1, TP33
<b>Packaging exceptions</b>	153
<b>Packaging non bulk</b>	213
<b>Packaging bulk</b>	240

#### IATA

<b>UN number</b>	UN2811
<b>UN proper shipping name</b>	Toxic solid, organic, n.o.s. (cis-Chlordane)
<b>Transport hazard class(es)</b>	
<b>Class</b>	6.1(PGIII)
<b>Subsidiary risk</b>	-
<b>Packing group</b>	III
<b>Environmental hazards</b>	No.
<b>ERG Code</b>	6L
<b>Special precautions for user</b>	Read safety instructions, SDS and emergency procedures before handling.
<b>Other information</b>	
<b>Passenger and cargo aircraft</b>	Allowed.
<b>Cargo aircraft only</b>	Allowed.

#### IMDG

<b>UN number</b>	UN2811
<b>UN proper shipping name</b>	TOXIC SOLID, ORGANIC, N.O.S. (cis-Chlordane), MARINE POLLUTANT
<b>Transport hazard class(es)</b>	
<b>Class</b>	6.1(PGIII)
<b>Subsidiary risk</b>	-
<b>Packing group</b>	III
<b>Environmental hazards</b>	
<b>Marine pollutant</b>	Yes
<b>EmS</b>	F-A, S-A
<b>Special precautions for user</b>	Read safety instructions, SDS and emergency procedures before handling.

**Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code** Not applicable.

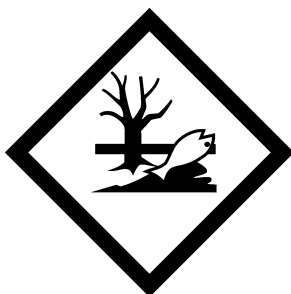
DOT



IATA; IMDG



Marine pollutant



### 15. Regulatory information

#### US federal regulations

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.  
One or more components are not listed on TSCA.

#### TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

#### CERCLA Hazardous Substance List (40 CFR 302.4)

cis-Chlordane (CAS 5103-71-9) Listed.

#### SARA 304 Emergency release notification

cis-Chlordane (CAS 5103-71-9) 1 LBS

#### US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

#### Superfund Amendments and Reauthorization Act of 1986 (SARA)

##### Hazard categories

Immediate Hazard - Yes  
Delayed Hazard - Yes  
Fire Hazard - No  
Pressure Hazard - No  
Reactivity Hazard - No

#### SARA 302 Extremely hazardous substance

Chemical name	CAS number	Reportable quantity	Threshold planning quantity	Threshold planning quantity, lower value	Threshold planning quantity, upper value
cis-Chlordane	5103-71-9	1	1000 lbs		

SARA 311/312 Hazardous chemical Yes

#### SARA 313 (TRI reporting)

Chemical name	CAS number	% by wt.
cis-Chlordane	5103-71-9	100

#### Other federal regulations

##### Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

cis-Chlordane (CAS 5103-71-9)

**Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)**

Not regulated.

**Clean Water Act (CWA) Section 112(r) (40 CFR 68.130)** Hazardous substance**Safe Drinking Water Act (SDWA)** 0 mg/l  
0.002 mg/l**US state regulations****US. Massachusetts RTK - Substance List**

cis-Chlordane (CAS 5103-71-9)

**US. New Jersey Worker and Community Right-to-Know Act**

cis-Chlordane (CAS 5103-71-9) 500 LBS

**US. Pennsylvania RTK - Hazardous Substances**

cis-Chlordane (CAS 5103-71-9)

**US. Rhode Island RTK**

Not regulated.

**US. California Proposition 65**

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

**US - California Proposition 65 - CRT: Listed date/Carcinogenic substance**

cis-Chlordane (CAS 5103-71-9) Listed: July 1, 1988

**International Inventories**

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	No
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	No
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	No

\*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

**16. Other information, including date of preparation or last revision**

**Issue date** 06-12-2014  
**Version #** 01  
**NFPA ratings** Health: 2  
Flammability: 1  
Instability: 0

## Disclaimer

The above information is believed to be correct on the date it was last revised and must not be considered all inclusive. The information has been obtained only by a search of available literature and is only a guide for handling the chemicals. OSHA regulations require that if other hazards become evident, an upgraded SDS must be made available to the employee within three months. RESPONSIBILITY for updates lies with the employer and not with CHEM SERVICE, Inc.

Persons not specifically and properly trained should not handle this chemical or its container. This product is furnished FOR LABORATORY USE ONLY! Our products may NOT BE USED as drugs, cosmetics, agricultural or pesticide products, food additives or as household chemicals.

This Safety Data Sheet (SDS) is intended only for use with Chem Service, Inc. products and should not be relied on for use with materials from any other supplier even if the chemical name(s) on the product are identical! Whenever using an SDS for a solution or mixture the user should refer to the SDS for every component of the solution or mixture. Chem Service warrants that this SDS is based upon the most current information available to Chem Service at the time it was last revised. THIS WARRANTY IS EXCLUSIVE, AND CHEM SERVICE, INC. MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. This SDS is provided gratis and CHEM SERVICE, INC. SHALL NOT BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR CONTINGENT DAMAGES.

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This product is furnished FOR LABORATORY USE ONLY.

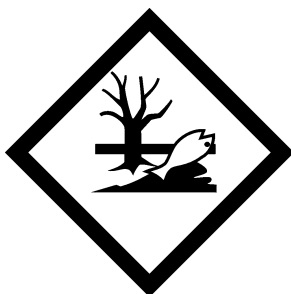
DOT



IATA; IMDG



Marine pollutant



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Korea	Existing Chemicals List (ECL)	Yes
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Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	No

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**Issue date** 06-12-2014  
**Version #** 01  
**NFPA ratings** Health: 2  
Flammability: 1  
Instability: 0

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Persons not specifically and properly trained should not handle this chemical or its container. This product is furnished FOR LABORATORY USE ONLY! Our products may NOT BE USED as drugs, cosmetics, agricultural or pesticide products, food additives or as household chemicals.

This Safety Data Sheet (SDS) is intended only for use with Chem Service, Inc. products and should not be relied on for use with materials from any other supplier even if the chemical name(s) on the product are identical! Whenever using an SDS for a solution or mixture the user should refer to the SDS for every component of the solution or mixture. Chem Service warrants that this SDS is based upon the most current information available to Chem Service at the time it was last revised. THIS WARRANTY IS EXCLUSIVE, AND CHEM SERVICE, INC. MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. This SDS is provided gratis and CHEM SERVICE, INC. SHALL NOT BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR CONTINGENT DAMAGES.

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This product is furnished FOR LABORATORY USE ONLY.

## SAFETY DATA SHEET

Version 6.3  
Revision Date 04/17/2021  
Print Date 09/11/2021

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : δ-BHC  
Product Number : 48495  
Brand : Supelco  
Index-No. : 602-042-00-0  
CAS-No. : 319-86-8

**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 3), H301  
Acute toxicity, Dermal (Category 4), H312  
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 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/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/ doctor. Rinse mouth.
P302 + P352 + P312	IF ON SKIN: Wash with plenty of water.Call a POISON CENTER/ doctor 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

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Synonyms	: δ-1,2,3,4,5,6-Hexachlorocyclohexane
Formula	: C <sub>6</sub> H <sub>6</sub> Cl <sub>6</sub>
Molecular weight	: 290.8 g/mol
CAS-No.	: 319-86-8
EC-No.	: 206-272-9
Index-No.	: 602-042-00-0

Component	Classification	Concentration
<b>1α,2α,3α,4β,5α,6β)-1,2,3,4,5,6-Hexachlorocyclohexane</b>		
	Acute Tox. 3; Acute Tox. 4; Carc. 2; Aquatic Acute 1; Aquatic Chronic 1; H301, H312, H351, H400, H410 M-Factor - Aquatic Acute: 10 - Aquatic Chronic: 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. 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

#### 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

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

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.

Store at room temperature.

Storage class (TRGS 510): 6.1D: 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

---

## SECTION 8: Exposure controls/personal protection

### 8.1 Control parameters

#### Ingredients 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

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 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**

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: 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 | No data available |

Supelco - 48495

Page 5 of 10

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

LD50 Oral - Rat - 1,000 mg/kg

Remarks: (RTECS)

Inhalation: No data available

Acute toxicity estimate Dermal - Expert judgment - 1,100.1 mg/kg

Remarks: (in analogy to similar products)

The value is given in analogy to the following substances: 1,2,3,4,5,6-hexachlorocyclohexanes with the exception of gamma-HCH

Acute toxicity estimate Dermal - 1,100.1 mg/kg

(Expert judgment)

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

Suspected of causing cancer.

IARC: 2B - Group 2B: Possibly carcinogenic to humans (1 $\alpha$ ,2 $\alpha$ ,3 $\alpha$ ,4 $\beta$ ,5 $\alpha$ ,6 $\beta$ )-1,2,3,4,5,6-Hexachlorocyclohexane)

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

### 11.2 Additional Information

RTECS: GV4550000

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

Central nervous system -

---

## SECTION 12: Ecological information

### 12.1 Toxicity

Toxicity to fish LC50 - *Oncorhynchus mykiss* (rainbow trout) - 0.02 mg/l - 96 h  
Remarks: (ECOTOX Database)  
(in analogy to similar products)  
The value is given in analogy to the following substances:  
1,2,3,4,5,6-hexachlorocyclohexanes with the exception of gamma-HCH

Toxicity to daphnia and other aquatic invertebrates EC50 - *Daphnia pulex* (Water flea) - 0.68 mg/l - 48 h  
Remarks: (ECOTOX Database)  
(in analogy to similar products)  
The value is given in analogy to the following substances:  
1,2,3,4,5,6-hexachlorocyclohexanes with the exception of gamma-HCH

### 12.2 Persistence and degradability

No data available

### 12.3 Bioaccumulative potential

Bioaccumulation other fish - 33 d  
- 0.955 mg/l(1 $\alpha$ ,2 $\alpha$ ,3 $\alpha$ ,4 $\beta$ ,5 $\alpha$ ,6 $\beta$ )-1,2,3,4,5,6-Hexachlorocyclohexane)

Bioconcentration factor (BCF): 326

### 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

---

## 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: 3077 Class: 9 Packing group: III  
Proper shipping name: Environmentally hazardous substance, solid, n.o.s.  
(1 $\alpha$ ,2 $\alpha$ ,3 $\alpha$ ,4 $\beta$ ,5 $\alpha$ ,6 $\beta$ )-1,2,3,4,5,6-Hexachlorocyclohexane)  
Reportable Quantity (RQ): 1 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.  
(1 $\alpha$ ,2 $\alpha$ ,3 $\alpha$ ,4 $\beta$ ,5 $\alpha$ ,6 $\beta$ )-1,2,3,4,5,6-Hexachlorocyclohexane)  
Marine pollutant : yes

**IATA**

UN number: 3077 Class: 9 Packing group: III  
Proper shipping name: Environmentally hazardous substance, solid, n.o.s.  
(1 $\alpha$ ,2 $\alpha$ ,3 $\alpha$ ,4 $\beta$ ,5 $\alpha$ ,6 $\beta$ )-1,2,3,4,5,6-Hexachlorocyclohexane)

**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.

---

**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, Chronic Health Hazard

**Massachusetts Right To Know Components**

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

**Pennsylvania Right To Know Components**

1 $\alpha$ ,2 $\alpha$ ,3 $\alpha$ ,4 $\beta$ ,5 $\alpha$ ,6 $\beta$ )-1,2,3,4,5,6- Hexachlorocyclohexane	CAS-No. 319-86-8	Revision Date 1993-02-16
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## **SECTION 16: Other information**

### **Further information**

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](http://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: 6.3

Revision Date: 04/17/2021

Print Date: 09/11/2021

## SAFETY DATA SHEET

Version 6.3  
Revision Date 09/14/2021  
Print Date 09/14/2021**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Dieldrin  
Product Number : 291218  
Brand : Aldrich  
Index-No. : 602-049-00-9  
CAS-No. : 60-57-1

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

Company : Sigma-Aldrich 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 2), H300  
Acute toxicity, Dermal (Category 1), H310  
Carcinogenicity (Category 2), H351  
Specific target organ toxicity - repeated exposure, Oral (Category 1), H372  
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 GHS Label elements, including precautionary statements**

Pictogram



Signal word	Danger
Hazard statement(s)	
H300 + H310	Fatal if swallowed or in contact with skin.
H351	Suspected of causing cancer.
H372	Causes damage to organs through prolonged or repeated exposure if swallowed.
H410	Very toxic to aquatic life with long lasting effects.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust/ fume/ gas/ mist/ vapors/ spray.
P262	Do not get in eyes, on skin, or on clothing.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/ doctor. Rinse mouth.
P302 + P350 + P310	IF ON SKIN: Gently wash with plenty of soap and water. Immediately call a POISON CENTER or doctor/ physician.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

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

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Synonyms	: 1,2,3,4,10,10-Hexachloro-1,4,4a,5,6,7,8,8a-octahydro-6,7-epoxy-1,4:5,8-dimethanonaphthalene
Formula	: C <sub>12</sub> H <sub>8</sub> Cl <sub>6</sub> O
Molecular weight	: 380.91 g/mol
CAS-No.	: 60-57-1
EC-No.	: 200-484-5
Index-No.	: 602-049-00-9

Component	Classification	Concentration
<b>Dieldrin</b>	Acute Tox. 2; Acute Tox. 1; Carc. 2; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H300, H310, H351, H372, H400, H410 M-Factor - Aquatic Acute: 100	<= 100 %

	M-Factor - Aquatic Chronic: 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. 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**

#### **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**

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

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**

Storage class (TRGS 510): 6.1B: 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

---

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

### **8.1 Control parameters**

#### **Ingredients with workplace control parameters**

Component	CAS-No.	Value	Control parameters	Basis
Dieldrin	60-57-1	TWA	0.1 mg/m <sup>3</sup>	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		TWA	0.25 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen Potential for dermal absorption		
		TWA	0.25 mg/m <sup>3</sup>	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		TWA	0.25 mg/m <sup>3</sup>	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		Skin notation		
		PEL	0.25 mg/m <sup>3</sup>	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

## 8.2 Exposure controls

### Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

### Personal protective equipment

#### Eye/face protection

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

#### Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the 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**

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: 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: 143 - 144 °C (289 - 291 °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) 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

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

LD50 Oral - Rat - 38.3 mg/kg

Inhalation: No data available

Dermal: No data available

LD50 Dermal - 5 mg/kg

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



This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC: No 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

No data available

#### **Specific target organ toxicity - single exposure**

No data available

#### **Specific target organ toxicity - repeated exposure**

Ingestion - Causes damage to organs through prolonged or repeated exposure. **Aspiration hazard**

No data available

### **11.2 Additional Information**

RTECS: IO1750000

Discomfort, Headache, Nausea, Vomiting, Dizziness, Tremors, tonic convulsions, clonic spasms, Coma., respiratory failure, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Blood - Irregularities - Based on Human Evidence

Blood - Irregularities - Based on Human Evidence

---

## **SECTION 12: Ecological information**

### **12.1 Toxicity**

Toxicity to fish                      mortality LC50 - Carassius auratus (goldfish) - 1.6 µg/l - 96.0 h

Toxicity to daphnia and other aquatic invertebrates                      Immobilization EC50 - Daphnia magna (Water flea) - 79.5 µg/l - 48 h

### **12.2 Persistence and degradability**

No data available

### **12.3 Bioaccumulative potential**

No data available

### **12.4 Mobility in soil**

No data available

### **12.5 Results of PBT and vPvB assessment**

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

## 12.6 Other adverse effects

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

Very toxic to aquatic life with long lasting effects.

---

## 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: 2811 Class: 6.1 Packing group: I  
Proper shipping name: Toxic solids, organic, n.o.s. (Dieldrin)  
Reportable Quantity (RQ): 1 lbs

1) Marine pollutant: yes Poison Inhalation Hazard: No

### IMDG

UN number: 2811 Class: 6.1 Packing group: I EMS-No: F-A, S-A  
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (Dieldrin)  
Marine pollutant : yes

### IATA

UN number: 2811 Class: 6.1 Packing group: I  
Proper shipping name: Toxic solid, organic, n.o.s. (Dieldrin)  
IATA Passenger: Not permitted for transport

---

## 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, Chronic Health Hazard

### Massachusetts Right To Know Components

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

---

**SECTION 16: Other information**

**Further information**

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](http://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: 6.3

Revision Date: 09/14/2021

Print Date: 09/14/2021

# SAFETY DATA SHEET

Version 6.5  
Revision Date 04/18/2021  
Print Date 09/11/2021

## SECTION 1: Identification of the substance/mixture and of the company/undertaking

### 1.1 Product identifiers

Product name : Endrin  
Product Number : 32014  
Brand : Sigma-Aldrich  
Index-No. : 602-051-00-X  
CAS-No. : 72-20-8

### 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 1), H300  
Acute toxicity, Dermal (Category 1), H310  
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 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)	
H300 + H310	Fatal if swallowed or in contact with skin.
H410	Very toxic to aquatic life with long lasting effects.
Precautionary statement(s)	
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 + P330	IF SWALLOWED: Immediately call a POISON CENTER/ doctor. Rinse mouth.
P302 + P350 + P310	IF ON SKIN: Gently wash with plenty of soap and water. Immediately call a POISON CENTER or doctor/ physician.
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

---

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Formula	: C <sub>12</sub> H <sub>8</sub> Cl <sub>6</sub> O
Molecular weight	: 380.91 g/mol
CAS-No.	: 72-20-8
EC-No.	: 200-775-7
Index-No.	: 602-051-00-X

Component	Classification	Concentration
<b>Endrin</b>	Acute Tox. 1; Aquatic Acute 1; Aquatic Chronic 1; H300, H310, H400, H410 M-Factor - Aquatic Acute: 100 - Aquatic Chronic: 100	<= 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 aiders need to protect themselves. Show this material safety data sheet to the doctor in attendance.

#### If inhaled

After inhalation: fresh air.

**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. Remove contact lenses.

**If swallowed**

If swallowed: give water to drink (two glasses at most). Seek medical advice immediately. In exceptional cases only, if medical care is not available within one hour, induce vomiting (only in persons who are wide awake and fully conscious), administer activated charcoal (20 - 40 g in a 10% slurry) and consult a doctor as quickly as possible.

**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 (CO<sub>2</sub>) 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 chloride gas

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

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): 6.1A: 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

---

## SECTION 8: Exposure controls/personal protection

### 8.1 Control parameters

#### Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Endrin	72-20-8	TWA	0.1 mg/m <sup>3</sup>	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Not classifiable as a human carcinogen Danger of cutaneous absorption		
		TWA	0.1 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		
		TWA	0.1 mg/m <sup>3</sup>	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		TWA	0.1 mg/m <sup>3</sup>	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		Skin notation		
		PEL	0.1 mg/m <sup>3</sup>	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

## 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](http://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<br>Color: colorless |
| 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        | No data available               |



- and boiling range
- 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 insoluble
  - o) Partition coefficient: n-octanol/water log Pow: 5.20
  - p) Autoignition temperature No data available
  - q) Decomposition temperature 226.0 °C (438.8 °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

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

LD50 Oral - Rat - 3.0 mg/kg

Inhalation: No data available

LD50 Dermal - Rat - 12.0 mg/kg

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

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 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

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

RTECS: IO1575000

Central nervous system -

---

## SECTION 12: Ecological information

### 12.1 Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - < 0.001 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia pulex (Water flea) - 0.02 mg/l - 48 h
	Immobilization EC50 - Daphnia magna (Water flea) - 0.0042 mg/l - 48 h

### 12.2 Persistence and degradability

No data available

### 12.3 Bioaccumulative potential

Bioaccumulation Pimephales promelas (fathead minnow) - 56 d - 0.63 mg/l(Endrin)

Bioconcentration factor (BCF): 13,000

### 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

---

## 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](http://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: 2811 Class: 6.1 Packing group: I

Proper shipping name: Toxic solids, organic, n.o.s. (Endrin)

Reportable Quantity (RQ): 1 lbs

Reportable Quantity (RQ): 1 lbs

1) Marine pollutant: yes Poison Inhalation Hazard: No

### IMDG

UN number: 2811 Class: 6.1 Packing group: I

EMS-No: F-A, S-A

Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (Endrin)

Marine pollutant : yes

**IATA**

UN number: 2811 Class: 6.1 Packing group: I  
Proper shipping name: Toxic solid, organic, n.o.s. (Endrin)

---

**SECTION 15: Regulatory information****SARA 302 Components**

Endrin	CAS-No. 72-20-8	Revision Date 2007-07-01
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**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

**Reportable Quantity** : D012 lbs

**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](http://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: 6.5

Revision Date: 04/18/2021

Print Date: 09/11/2021

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****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, 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 STATESTelephone : +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 3), H301  
Acute toxicity, Dermal (Category 3), H311  
Carcinogenicity (Category 2), H351  
Specific target organ toxicity - repeated exposure (Category 2), H373  
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 GHS Label elements, including precautionary statements**

Pictogram



Signal word	Danger
Hazard statement(s)	
H301 + H311	Toxic 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/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/ doctor. Rinse mouth.
P302 + P352 + P312	IF ON SKIN: Wash with plenty of water. Call a POISON CENTER/ doctor if you feel unwell.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

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

## SECTION 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
Molecular weight	:	373.32 g/mol
CAS-No.	:	76-44-8
EC-No.	:	200-962-3
Index-No.	:	602-046-00-2

Component	Classification	Concentration
<b>Heptachlor</b>		
	Acute Tox. 3; Carc. 2; STOT RE 2; Aquatic Acute 1; Aquatic Chronic 1; H301, H311, H351, H373, H400, H410 M-Factor - Aquatic Acute: 100 M-Factor - Aquatic	<= 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 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. Call in ophthalmologist. Remove contact lenses.

#### If swallowed

If swallowed: give water to drink (two glasses at most). Seek medical advice immediately. In exceptional cases only, if medical care is not available within one hour, induce vomiting (only in persons who are wide awake and fully conscious), administer activated charcoal (20 - 40 g in a 10% slurry) and consult a doctor as quickly as possible.

### 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 (CO<sub>2</sub>) 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 chloride gas

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

Storage class (TRGS 510): 6.1A: 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

---

### SECTION 8: Exposure controls/personal protection

#### 8.1 Control parameters

##### Ingredients with workplace control parameters





Component	CAS-No.	Value	Control parameters	Basis
Heptachlor	76-44-8	TWA	0.5 mg/m <sup>3</sup>	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	Skin designation		
		TWA	0.5 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen Potential for dermal absorption		
		PEL	0.05 mg/m <sup>3</sup>	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

## 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 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

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: 95 - 96 °C (203 - 205 °F) |
| f) Initial boiling point and boiling range      | 145 °C 293 °F at 199.99 hPa              |
| 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) Vapor pressure                               | No data available                        |
| l) Vapor density                                | No data available                        |
| m) Density                                      | 1.57 g/cm <sup>3</sup> at 9 °C (48 °F)   |
| 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

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

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

LD50 Oral - Mouse - 68.0 mg/kg

Remarks: (RTECS)

Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Inhalation: No data available

LD50 Dermal - Rabbit - 500.0 mg/kg

Remarks: (RTECS)

Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

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

Suspected of causing cancer.

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Heptachlor)

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**

May cause damage to organs through prolonged or repeated exposure. Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

### **Aspiration hazard**

No data available

## **11.2 Additional Information**

RTECS: PC0700000

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) - 0.007 mg/l - 96.0 h  
Remarks: (ECOTOX Database)

Toxicity to daphnia and other aquatic invertebrates LC50 - Daphnia magna (Water flea) - 0.078 mg/l - 48 h  
Remarks: (ECOTOX Database)

### **12.2 Persistence and degradability**

No data available

### **12.3 Bioaccumulative potential**

Bioaccumulation Pimephales promelas (fathead minnow) - 276 d  
- 0.00043 mg/l(Heptachlor)

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**

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](http://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: 2811 Class: 6.1 Packing group: II  
Proper shipping name: Toxic solids, organic, n.o.s. (Heptachlor)  
Reportable Quantity (RQ): 1 lbs  
Reportable Quantity (RQ): 1 lbs  
1) 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)

---

**SECTION 15: Regulatory information****SARA 302 Components**

This material does not contain any components with a section 302 EHS TPQ.

**SARA 313 Components**

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Heptachlor	76-44-8	2007-03-01

**SARA 311/312 Hazards**

Acute Health Hazard, Chronic Health Hazard

Reportable Quantity : D031 lbs

**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](http://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: 8.0

Revision Date: 09/13/2021

Print Date: 09/14/2021



**SECTION 1: Identification of the substance/mixture and of the company/undertaking****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, 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 STATESTelephone : +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 3), H301  
Acute toxicity, Dermal (Category 3), H311  
Carcinogenicity (Category 2), H351  
Specific target organ toxicity - repeated exposure (Category 2), H373  
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 GHS Label elements, including precautionary statements**

Pictogram



Signal word	Danger
Hazard statement(s)	
H301 + H311	Toxic 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/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/ doctor. Rinse mouth.
P302 + P352 + P312	IF ON SKIN: Wash with plenty of water. Call a POISON CENTER/ doctor if you feel unwell.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

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

## SECTION 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
Molecular weight	:	373.32 g/mol
CAS-No.	:	76-44-8
EC-No.	:	200-962-3
Index-No.	:	602-046-00-2

Component	Classification	Concentration
<b>Heptachlor</b>		
	Acute Tox. 3; Carc. 2; STOT RE 2; Aquatic Acute 1; Aquatic Chronic 1; H301, H311, H351, H373, H400, H410 M-Factor - Aquatic Acute: 100 M-Factor - Aquatic	<= 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 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. Call in ophthalmologist. Remove contact lenses.

#### If swallowed

If swallowed: give water to drink (two glasses at most). Seek medical advice immediately. In exceptional cases only, if medical care is not available within one hour, induce vomiting (only in persons who are wide awake and fully conscious), administer activated charcoal (20 - 40 g in a 10% slurry) and consult a doctor as quickly as possible.

### 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 (CO<sub>2</sub>) 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 chloride gas

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

Storage class (TRGS 510): 6.1A: 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

---

### SECTION 8: Exposure controls/personal protection

#### 8.1 Control parameters

##### Ingredients with workplace control parameters



Component	CAS-No.	Value	Control parameters	Basis
Heptachlor	76-44-8	TWA	0.5 mg/m <sup>3</sup>	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	Skin designation		
		TWA	0.5 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen Potential for dermal absorption		
		PEL	0.05 mg/m <sup>3</sup>	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

## 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 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

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: 95 - 96 °C (203 - 205 °F)
f) Initial boiling point and boiling range	145 °C 293 °F at 199.99 hPa
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) Vapor pressure	No data available
l) Vapor density	No data available
m) Density	1.57 g/cm <sup>3</sup> at 9 °C (48 °F)
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



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## 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

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

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## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

#### Acute toxicity

LD50 Oral - Mouse - 68.0 mg/kg

Remarks: (RTECS)

Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Inhalation: No data available

LD50 Dermal - Rabbit - 500.0 mg/kg

Remarks: (RTECS)

Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

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

Suspected of causing cancer.

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Heptachlor)

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**

May cause damage to organs through prolonged or repeated exposure. Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

### **Aspiration hazard**

No data available

## **11.2 Additional Information**

RTECS: PC0700000

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) - 0.007 mg/l - 96.0 h  
Remarks: (ECOTOX Database)

Toxicity to daphnia                      LC50 - Daphnia magna (Water flea) - 0.078 mg/l - 48 h  
and other aquatic                      Remarks: (ECOTOX Database)  
invertebrates

### **12.2 Persistence and degradability**

No data available

### **12.3 Bioaccumulative potential**

Bioaccumulation                      Pimephales promelas (fathead minnow) - 276 d  
- 0.00043 mg/l(Heptachlor)

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**

No data available



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**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](http://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: 2811 Class: 6.1 Packing group: II  
Proper shipping name: Toxic solids, organic, n.o.s. (Heptachlor)  
Reportable Quantity (RQ): 1 lbs  
Reportable Quantity (RQ): 1 lbs  
1) 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)

---

**SECTION 15: Regulatory information****SARA 302 Components**

This material does not contain any components with a section 302 EHS TPQ.

**SARA 313 Components**

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Heptachlor	76-44-8	2007-03-01

**SARA 311/312 Hazards**

Acute Health Hazard, Chronic Health Hazard

Reportable Quantity : D031 lbs

**Massachusetts Right To Know Components**

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



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## 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](http://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: 8.0

Revision Date: 09/13/2021

Print Date: 09/14/2021





# SAFETY DATA SHEET

Version 6.4  
Revision Date 09/09/2021  
Print Date 09/11/2021

## SECTION 1: Identification of the substance/mixture and of the company/undertaking

### 1.1 Product identifiers

Product name : Lindane  
Product Number : 233390  
Brand : Aldrich  
Index-No. : 602-043-00-6  
CAS-No. : 58-89-9

### 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

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  
Acute toxicity, Inhalation (Category 4), H332  
Acute toxicity, Dermal (Category 4), H312  
Carcinogenicity (Category 1A), H350  
Effects on or via lactation, H362  
Specific target organ toxicity - repeated exposure (Category 2), H373  
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 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H301 Toxic if swallowed.  
H312 + H332 Harmful in contact with skin or if inhaled.  
H350 May cause cancer.  
H362 May cause harm to breast-fed children.  
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/ 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.  
P273 Avoid release to the environment.  
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.  
P301 + P310 + P330 IF SWALLOWED: Immediately call a POISON CENTER/ doctor. Rinse mouth.  
P302 + P352 + P312 IF ON SKIN: Wash with plenty of water. Call a POISON CENTER/ doctor if you feel unwell.  
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.  
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

---

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Synonyms : 1 $\alpha$ ,2 $\alpha$ ,3 $\beta$ ,4 $\alpha$ ,5 $\alpha$ ,6 $\beta$ -Hexachlorocyclohexane  
 $\gamma$ -BHC  
Formula : C<sub>6</sub>H<sub>6</sub>Cl<sub>6</sub>  
Molecular weight : 290.83 g/mol  
CAS-No. : 58-89-9  
EC-No. : 200-401-2  
Index-No. : 602-043-00-6

Component	Classification	Concentration
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<b>Gammaxene</b>		
	Acute Tox. 3; Acute Tox. 4; Carc. 1A; Lact. ; STOT RE 2; Aquatic Acute 1; Aquatic Chronic 1; H301, H332, H312, H350, H362, H373, H400, H410 M-Factor - Aquatic Acute: 1 - Aquatic Chronic: 1	<= 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. Call in ophthalmologist. Remove contact lenses.

#### If swallowed

If swallowed: give water to drink (two glasses at most). Seek medical advice immediately. In exceptional cases only, if medical care is not available within one hour, induce vomiting (only in persons who are wide awake and fully conscious), administer activated charcoal (20 - 40 g in a 10% slurry) and consult a doctor as quickly as possible.

### 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 chloride gas

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 inhalation of dusts. 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

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

Component	CAS-No.	Value	Control parameters	Basis
Gammaxene	58-89-9	TWA	0.5 mg/m <sup>3</sup>	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		TWA	0.5 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		
		TWA	0.5 mg/m <sup>3</sup>	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		PEL	0.5 mg/m <sup>3</sup>	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

### 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](http://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: 113 - 115 °C (235 - 239 °F) - lit.
f) Initial boiling point and boiling range	323.4 °C 614.1 °F at 1,013.25 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) Density	1.85 g/cm <sup>3</sup>
Relative density	No data available
n) Water solubility	8.35 g/l at 25 °C (77 °F)
o) Partition coefficient: n-octanol/water	Pow: 3.5 at 22 °C (72 °F) - Bioaccumulation is not expected.
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	none

Aldrich - 233390

Page 6 of 10

## 9.2 Other safety information

No data available

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## 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

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

LD50 Oral - Rat - 88.0 mg/kg

Remarks: (IUCLID)

LC50 Inhalation - Rat - 4 h - 1,560 mg/m<sup>3</sup>

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

Remarks: (IUCLID)

#### Respiratory or skin sensitization

No data available

#### Germ cell mutagenicity

No data available

#### Carcinogenicity

IARC: 1 - Group 1: Carcinogenic to humans (Gammaxene)

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**

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**

May cause damage to organs through prolonged or repeated exposure. Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

#### **Aspiration hazard**

No data available

### **11.2 Additional Information**

RTECS: GV4900000

Neurotoxic effects., Cyanosis, Headache, Nausea, Incoordination., Tremors, Vomiting, Dizziness, Seizures., Unconsciousness

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

Reproductive system. - Irregularities - Based on Human Evidence

Reproductive system. - Irregularities - Based on Human Evidence

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## **SECTION 12: Ecological information**

### **12.1 Toxicity**

Toxicity to fish LC50 - Cyprinus carpio (Carp) - 0.2 mg/l - 96.0 h  
Remarks: (ECOTOX Database)

Toxicity to daphnia and other aquatic invertebrates EC50 - Daphnia magna (Water flea) - 0.80 - 6.50 mg/l - 48 h  
Remarks: (ECOTOX Database)

LOEC - Daphnia - 0.021 mg/l - 7 d  
Remarks: (ECOTOX Database)

Toxicity to algae EC50 - Algae - 4.00 mg/l - 72 h  
Remarks: (ECOTOX Database)

### **12.2 Persistence and degradability**

No data available

### **12.3 Bioaccumulative potential**

Bioaccumulation Pimephales promelas (fathead minnow) - 304 d  
- 0.0091 mg/l(Gammaxene)

Bioconcentration factor (BCF): 674

### **12.4 Mobility in soil**

No data available

Aldrich - 233390

Page 8 of 10



## 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

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## 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](http://www.retrologistik.com) for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

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## SECTION 14: Transport information

### DOT (US)

UN number: 2811 Class: 6.1 Packing group: III  
Proper shipping name: Toxic solids, organic, n.o.s. (Gammaxene)  
Reportable Quantity (RQ): 1 lbs  
Reportable Quantity (RQ): 1 lbs  
1) 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. (Gammaxene)  
Marine pollutant : yes

### IATA

UN number: 2811 Class: 6.1 Packing group: III  
Proper shipping name: Toxic solid, organic, n.o.s. (Gammaxene)

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## SECTION 15: Regulatory information

### SARA 302 Components

Gammaxene	CAS-No. 58-89-9	Revision Date 2007-07-01
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### SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

Gammaxene	CAS-No. 58-89-9	Revision Date 2007-07-01
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### SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

:

**Reportable Quantity**      D013 lbs

**Massachusetts Right To Know Components**

Gammaxene	CAS-No. 58-89-9	Revision Date 2007-07-01
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No components are subject to the Massachusetts Right to Know Act.

**Pennsylvania Right To Know Components**

Gammaxene	CAS-No. 58-89-9	Revision Date 2007-07-01
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**New Jersey Right To Know Components**

Gammaxene	CAS-No. 58-89-9	Revision Date 2007-07-01
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**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](http://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: 09/09/2021

Print Date: 09/11/2021

IN CASE OF TRANSPORTATION EMERGENCY CONTACT:

**CHEMTREC:(800) 424-9300**

-----  
ALL OTHER INQUIRIES:  
(770) 904-7042 // [www.ciscochem.com](http://www.ciscochem.com)  
266 Rue Cezzan Lavonia, GA 30553



## 1. IDENTIFICATION

SUBSTANCE: TETRACHLOROETHYLENE

TRADE NAMES/SYNONYMS:

PERCHLOROETHYLENE; 1,1,2,2-TETRACHLOROETHYLENE; ETHYLENE TETRACHLORIDE; PERC;  
TETRACHLOROETHYLENE; PERCHLORETHYLENE; TETRACHLOROETHENE

CHEMICAL FAMILY: halogenated, aliphatic

## 2. HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=0 REACTIVITY=0

EMERGENCY OVERVIEW:

COLOR: colorless

PHYSICAL FORM: volatile liquid

ODOR: faint odor, sweet odor

MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation, central nervous system depression, cancer hazard (in humans)

POTENTIAL HEALTH EFFECTS:

INHALATION:

SHORT TERM EXPOSURE: irritation, nausea, vomiting, chest pain, difficulty breathing, irregular heartbeat, headache, drowsiness, dizziness, disorientation, mood swings, loss of coordination, blurred vision, lung congestion, kidney damage, liver damage

LONG TERM EXPOSURE: irritation, nausea, stomach pain, loss of appetite, headache, drowsiness, dizziness, disorientation, sleep disturbances, pain in extremities, loss of coordination, blurred vision, hormonal disorders, internal bleeding, heart damage, liver damage, birth defects, brain damage, tumors, cancer

SKIN CONTACT:

SHORT TERM EXPOSURE: irritation (possibly severe)

LONG TERM EXPOSURE: irritation

EYE CONTACT:

SHORT TERM EXPOSURE: irritation

LONG TERM EXPOSURE: irritation

INGESTION:

SHORT TERM EXPOSURE: same as effects reported in short term inhalation

LONG TERM EXPOSURE: same as effects reported in long term inhalation

## 3. COMPOSITION

COMPONENT: TETRACHLOROETHYLENE

CAS NUMBER: 127-18-4

PERCENTAGE: 100.0

Hazardous: YES

## 4. FIRST AID MEASURES

### Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

### Ingestion:

Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

### Skin Contact:

Wash skin with soap or mild detergent and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician.

### Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

### Note to Physician:

Do not administer adrenaline or epinephrine to a victim of chlorinated solvent poisoning.

## 5. FIRE FIGHTING MEASURES

**FIRE AND EXPLOSION HAZARDS:** Negligible fire hazard.

**EXTINGUISHING MEDIA:** carbon dioxide, regular dry chemical

Large fires: Use regular foam or flood with fine water spray.

**FIRE FIGHTING:** Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For tank, rail car or tank truck, evacuation radius: 800 meters (1/2 mile).

**FLASH POINT:** No data available.

### Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode

## 6. ACCIDENTAL RELEASE MEASURES

### SOIL RELEASE:

Dig holding area such as lagoon, pond or pit for containment. Dike for later disposal. Absorb with sand or other non-combustible material.

### WATER RELEASE:

Absorb with activated carbon. Remove trapped material with suction hoses. Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supplies and sewers.

### OCCUPATIONAL RELEASE:

Avoid heat, flames, sparks and other sources of ignition. Stop leak if possible without personal risk. Small liquid spills: Absorb with sand or other non-combustible material. Large spills: Dike for later disposal. Remove sources of ignition. 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).

## 7. HANDLING AND STORAGE

Store in a cool, dry, ventilated area away from sources of heat or ignition. Isolate from flammable materials. Protect from direct sunlight. Wear special protective equipment (Sec. 8) for maintenance break-in or where exposures may exceed established exposure levels. Wash hands, face, forearms and neck when exiting restricted areas. Shower, dispose of outer clothing, change to clean garments at the end of the day. Avoid cross-contamination of street clothes. Wash hands before eating and do not eat, drink, or

smoke in workplace. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

## 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Airborne Exposure Limits:

-OSHA Permissible Exposure Limit (PEL): 100 ppm (TWA), 200 ppm (ceiling),  
300 ppm/5min/3-hour (max)  
-ACGIH Threshold Limit Value (TLV):  
25 ppm (TWA), 100 ppm (STEL); listed as A3, animal carcinogen

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, Industrial Ventilation, A Manual of Recommended Practices, most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airtight hood, or full-facepiece self-contained breathing apparatus.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

CLOTHING: Wear appropriate chemical resistant clothing. GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.

At any detectable concentration -

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.

For Unknown Concentrations or Immediately Dangerous to Life or Health -

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.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid

APPEARANCE: clear

COLOR: colorless

PHYSICAL FORM: volatile liquid

ODOR: faint odor, sweet odor

MOLECULAR WEIGHT: 165.83

MOLECULAR FORMULA: Cl<sub>2</sub>-C-C-Cl<sub>2</sub>

BOILING POINT: 250 F (121 C)

FREEZING POINT: -2 F (-19 C)

VAPOR PRESSURE: 14 mmHg @ 20 C

VAPOR DENSITY (air=1): 5.83  
SPECIFIC GRAVITY (water=1): 1.6227  
WATER SOLUBILITY: 0.015%  
PH: Not available  
VOLATILITY: Not available  
ODOR THRESHOLD: 50 ppm  
EVAPORATION RATE: 2.8 (butyl acetate=1)  
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available  
SOLVENT SOLUBILITY:  
Soluble: alcohol, ether, benzene, chloroform, oils

## 10. STABILITY AND REACTIVITY

### Stability:

Stable under ordinary conditions of use and storage. Slowly decomposed by light. Deteriorates rapidly in warm, moist climates.

### Hazardous Decomposition Products:

Carbon dioxide and carbon monoxide may form when heated to decomposition. Hydrogen chloride gas and phosgene gas may be formed upon heating. Decomposes with moisture to yield trichloroacetic acid and hydrochloric acid.

### Hazardous Polymerization:

Will not occur.

### Incompatibilities:

Strong acids, strong oxidizers, strong alkalis, especially NaOH, KOH; finely divided metals, especially zinc, barium, lithium. Slowly corrodes aluminum, iron and zinc.

### Conditions to Avoid:

Moisture, light, heat and incompatibles.

## 11. TOXICOLOGICAL INFORMATION

### TETRACHLOROETHYLENE:

IRRITATION DATA: 810 mg/24 hour(s) skin-rabbit severe; 500 mg/24 hour(s) skin-rabbit mild; 162 mg eyes-rabbit mild; 500 mg/24 hour(s) eyes-rabbit mild

TOXICITY DATA: 4100 ppm/6 hour(s) inhalation-rat LC50; >10000 mg/kg skin-rabbit LD50 (Dow); 2629 mg/kg oral-rat LD50

CARCINOGEN STATUS: NTP: Anticipated Human Carcinogen; IARC: Human Limited Evidence, Animal Sufficient Evidence, Group 2A; ACGIH: A3 -Confirmed Animal Carcinogen; EC: Category 2

### LOCAL EFFECTS:

Irritant: inhalation, skin, eye

### ACUTE TOXICITY LEVEL:

Moderately Toxic: ingestion

Slightly Toxic: inhalation

TARGET ORGANS: central nervous system

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: eye disorders, heart or cardiovascular disorders, kidney disorders, liver disorders, nervous system disorders, skin disorders and allergies

TUMORIGENIC DATA: Available.

MUTAGENIC DATA: Available.

REPRODUCTIVE EFFECTS DATA: Available.

ADDITIONAL DATA: May be excreted in breast milk. Alcohol may enhance the toxic effects. Stimulants such as epinephrine may induce ventricular fibrillation.

## 12. ECOLOGICAL INFORMATION

### ECOTOXICITY DATA:

FISH TOXICITY: 8430 ug/L 96 hour(s) LC50 (Mortality) Flagfish (*Jordanella floridae*)

INVERTEBRATE TOXICITY: 7500 ug/L 48 hour(s) EC50 (Immobilization) Water flea (*Daphnia magna*)

ALGAL TOXICITY: 509000 ug/L 96 hour(s) EC50 (Photosynthesis) Diatom (*Skeletonema costatum*)

### FATE AND TRANSPORT:

BIOCONCENTRATION: 49 ug/L 1-21 hour(s) BCF (Residue) Bluegill (*Lepomis macrochirus*) 3.43 ug/L

#### Environmental Fate:

When released into the soil, this material is expected to quickly evaporate. When released into the soil, this material may leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released to water, this material is expected to quickly evaporate. When released into water, this material is not expected to biodegrade. This material is not expected to significantly bioaccumulate. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals.

#### Environmental Toxicity:

The LC50/96-hour values for fish are between 1 and 10 mg/l. The LC50/96-hour values for fish are between 10 and 100 mg/l. This material is expected to be toxic to aquatic life.

## 13. DISPOSAL CONSIDERATIONS

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

## 14. TRANSPORT INFORMATION

### Domestic (Land, D.O.T.)

-----  
Proper Shipping Name: TETRACHLOROETHYLENE Hazard Class: 6.1

UN/NA: UN1897

Packing Group: III

Information reported for product/size: 20L

International (Water, I.M.O.)

-----  
Proper Shipping Name: TETRACHLOROETHYLENE Hazard Class: 6.1

UN/NA: UN1897

Packing Group: III

Information reported for product/size: 20L

Proper shipping paperwork:

UN 1897, Tetrachoroethylene, 6.1, PG III

Marine Pollutant

## 15. REGULATORY INFORMATION

### U.S. REGULATIONS:

CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4): TETRACHLOROETHYLENE (PERCHLOROETHYLENE): 100 LBS RQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES

(40 CFR 355 Subpart B): Not regulated.

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES

(40 CFR 355 Subpart C): Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370 Subparts B and C):

ACUTE: Yes

CHRONIC: Yes

FIRE: No

REACTIVE: No

SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65): TETRACHLOROETHYLENE (PERCHLOROETHYLENE)

OSHA PROCESS SAFETY (29 CFR 1910.119): Not regulated.

STATE REGULATIONS:

California Proposition 65:

Known to the state of California to cause the following: TETRACHLOROETHYLENE (PERCHLOROETHYLENE) Cancer (Apr 01, 1988)

CANADIAN REGULATIONS: WHMIS CLASSIFICATION: D2

NATIONAL INVENTORY STATUS:

U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed. CANADA INVENTORY (DSL/NDSL): Not determined.

## 16. OTHER INFORMATION

NFPA Ratings: Health: 2 Flammability: 0 Reactivity: 0

Label Hazard Warning:

WARNING! HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM, LIVER AND KIDNEYS. SUSPECT CANCER HAZARD. MAY CAUSE CANCER. Risk of cancer depends on level and duration of exposure.

Label Precautions:

Do not get in eyes, on skin, or on clothing.

Do not breathe vapor or mist.

Keep container closed.

Use only with adequate ventilation.

Wash thoroughly after handling.

Label First Aid:

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

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases call a physician.

Product Use:

Laboratory Reagent.

CISCO provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product.

Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. CISCO MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS.



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Date Created: 5/18/2015

Date Updated: 6/11/2015

## SAFETY DATA SHEET

Creation Date 02-Jun-2010

Revision Date 18-Jan-2018

Revision Number 3

### 1. Identification

**Product Name** Zinc Metal Powder

**Cat No. :** Z5-500; Z46-3

**CAS-No** 7440-66-6  
**Synonyms** Zinc Dust (Certified/Technical)

**Recommended Use** Laboratory chemicals.  
**Uses advised against** Not for food, drug, pesticide or biocidal product use

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

##### Company

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

##### **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)

Substances/mixtures which, in contact with water, emit flammable gases	Category 1
Pyrophoric solids	Category 1
Combustible dust	Yes

#### Label Elements

##### **Signal Word**

Danger

##### **Hazard Statements**

May form combustible dust concentrations in air  
In contact with water releases flammable gases which may ignite spontaneously  
Catches fire spontaneously if exposed to air

**Precautionary Statements****Prevention**

Keep away from heat/sparks/open flames/hot surfaces. - No smoking

Do not allow contact with air

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

Keep away from any possible contact with water, because of violent reaction and possible flash fire

Handle under inert gas. Protect from moisture

**Skin**

Brush off loose particles from skin. Immerse in cool water/wrap with wet bandages

**Fire**

In case of fire: Use CO<sub>2</sub>, dry chemical, or foam for extinction

**Storage**

Store under an inert atmosphere

Store in a dry place. Store in a closed container

Store in a well-ventilated place. Keep container tightly closed

**Disposal**

Dispose of contents/container to an approved waste disposal plant

**Hazards not otherwise classified (HNOC)**

Very toxic to aquatic life with long lasting effects

### 3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Zinc powder - zinc dust (pyrophoric)	7440-66-6	100

### 4. First-aid measures

<b>Eye Contact</b>	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.
<b>Skin Contact</b>	Wash off immediately with plenty of water for at least 15 minutes. Get medical attention if symptoms occur.
<b>Inhalation</b>	Move to fresh air. If breathing is difficult, give oxygen. Get medical attention if symptoms occur.
<b>Ingestion</b>	Do not induce vomiting. Obtain medical attention.
<b>Most important symptoms and effects</b>	No information available.
<b>Notes to Physician</b>	Treat symptomatically

### 5. Fire-fighting measures

<b>Suitable Extinguishing Media</b>	Dry sand, clay, approved class D extinguishers.
<b>Unsuitable Extinguishing Media</b>	DO NOT USE WATER, Carbon dioxide (CO <sub>2</sub> ), Dry chemical, Foam
<b>Flash Point</b>	No information available

<b>Method -</b>	No information available
<b>Autoignition Temperature</b>	460 °C / 860 °F
<b>Explosion Limits</b>	
<b>Upper</b>	No data available
<b>Lower</b>	No data available
<b>Sensitivity to Mechanical Impact</b>	No information available
<b>Sensitivity to Static Discharge</b>	No information available

**Specific Hazards Arising from the Chemical**

Flammable. Fine dust dispersed in air may ignite. Pyrophoric: Spontaneously flammable in air. Water reactive. Contact with water liberates extremely flammable gases. 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**

Hydrogen

**Protective Equipment and Precautions for Firefighters**

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

**NFPA**

<b>Health</b>	<b>Flammability</b>	<b>Instability</b>	<b>Physical hazards</b>
1	4	3	W

## 6. Accidental release measures

<b>Personal Precautions</b>	Use personal protective equipment. Remove all sources of ignition. Avoid dust formation. Take precautionary measures against static discharges. Do not get in eyes, on skin, or on clothing.
<b>Environmental Precautions</b>	Should not be released into the environment. See Section 12 for additional ecological information.
<b>Methods for Containment and Clean Up</b>	Remove all sources of ignition. Do not expose spill to water. Sweep up or vacuum up spillage and collect in suitable container for disposal. Use spark-proof tools and explosion-proof equipment. Avoid dust formation.

## 7. Handling and storage

<b>Handling</b>	Use only under a chemical fume hood. Wear personal protective equipment. Avoid dust formation. Avoid contact with skin, eyes and clothing. Avoid ingestion and inhalation. Handle under an inert atmosphere. Do not allow contact with air. Do not allow contact with water. Keep away from open flames, hot surfaces and sources of ignition. Use spark-proof tools and explosion-proof equipment. Take precautionary measures against static discharges.
<b>Storage</b>	Keep containers tightly closed in a dry, cool and well-ventilated place. Store under an inert atmosphere. Keep away from heat and sources of ignition. Keep away from water.

## 8. Exposure controls / personal protection

<b>Exposure Guidelines</b>	This product does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.
<b>Engineering Measures</b>	Use only under a chemical fume hood. Use explosion-proof electrical/ventilating/lighting/equipment. Ensure that eyewash stations and safety showers are close to the workstation location.
<b>Personal Protective Equipment</b>	

<b>Eye/face Protection</b>	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
<b>Skin and body protection</b>	Wear appropriate protective gloves and clothing to prevent skin exposure.
<b>Respiratory Protection</b>	Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.
<b>Hygiene Measures</b>	Handle in accordance with good industrial hygiene and safety practice.

## 9. Physical and chemical properties

<b>Physical State</b>	Solid
<b>Appearance</b>	Light blue
<b>Odor</b>	Odorless
<b>Odor Threshold</b>	No information available
<b>pH</b>	No information available
<b>Melting Point/Range</b>	419 °C / 786.2 °F
<b>Boiling Point/Range</b>	908 °C / 1666.4 °F
<b>Flash Point</b>	No information available
<b>Evaporation Rate</b>	No information available
<b>Flammability (solid,gas)</b>	No information available
<b>Flammability or explosive limits</b>	
<b>Upper</b>	No data available
<b>Lower</b>	No data available
<b>Vapor Pressure</b>	1 mmHg @ 487 °C
<b>Vapor Density</b>	No information available
<b>Specific Gravity</b>	7.14
<b>Solubility</b>	Insoluble in water
<b>Partition coefficient; n-octanol/water</b>	No data available
<b>Autoignition Temperature</b>	460 °C / 860 °F
<b>Decomposition Temperature</b>	No information available
<b>Viscosity</b>	No information available
<b>Molecular Formula</b>	Zn
<b>Molecular Weight</b>	65.37

## 10. Stability and reactivity

<b>Reactive Hazard</b>	Yes
<b>Stability</b>	Water reactive. Moisture sensitive. Air sensitive. Pyrophoric: Spontaneously flammable in air.
<b>Conditions to Avoid</b>	Avoid dust formation. Incompatible products. Exposure to air. Exposure to moist air or water. Keep away from open flames, hot surfaces and sources of ignition.
<b>Incompatible Materials</b>	Strong oxidizing agents, Strong acids, Strong bases, Amines
<b>Hazardous Decomposition Products</b>	Hydrogen
<b>Hazardous Polymerization</b>	Hazardous polymerization does not occur.
<b>Hazardous Reactions</b>	Contact with water liberates extremely flammable gases. Pyrophoric: Spontaneously flammable in air.

## 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
Zinc powder - zinc dust (pyrophoric)	LD50 = 630 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
Zinc powder - zinc dust (pyrophoric)	7440-66-6	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** 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** Tumorigenic effects have been reported in experimental animals. See actual entry in RTECS for complete information.

## 12. Ecological information

**Ecotoxicity**

This product contains the following substance(s) which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Zinc powder - zinc dust (pyrophoric)	EC50: 0.09 - 0.125 mg/L, 72h static (Pseudokirchneriella subcapitata) EC50: 0.11 - 0.271 mg/L, 96h static (Pseudokirchneriella subcapitata)	LC50: 0.211 - 0.269 mg/L, 96h semi-static (Pimephales promelas) LC50: = 2.66 mg/L, 96h static (Pimephales promelas) LC50: = 30 mg/L, 96h (Cyprinus carpio) LC50: = 0.45 mg/L, 96h semi-static (Cyprinus carpio) LC50: = 7.8 mg/L, 96h static (Cyprinus carpio) LC50: = 3.5 mg/L, 96h static (Lepomis macrochirus) LC50: = 0.24 mg/L, 96h flow-through (Oncorhynchus mykiss)	Not listed	EC50: 0.139 - 0.908 mg/L, 48h Static (Daphnia magna)

		LC50: = 0.59 mg/L, 96h semi-static (Oncorhynchus mykiss) LC50: 2.16 - 3.05 mg/L, 96h flow-through (Pimephales promelas) LC50: = 0.41 mg/L, 96h static (Oncorhynchus mykiss)		
--	--	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--	--

**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 UN1436  
 Proper Shipping Name ZINC POWDER  
 Hazard Class 4.3  
 Subsidiary Hazard Class 4.2  
 Packing Group II

**TDG**  
 UN-No UN1436  
 Proper Shipping Name ZINC POWDER  
 Hazard Class 4.3  
 Subsidiary Hazard Class 4.2  
 Packing Group II

**IATA**  
 UN-No UN1436  
 Proper Shipping Name ZINC POWDER  
 Hazard Class 4.3  
 Subsidiary Hazard Class 4.2  
 Packing Group II

**IMDG/IMO**  
 UN-No UN1436  
 Proper Shipping Name ZINC POWDER  
 Hazard Class 4.3  
 Subsidiary Hazard Class 4.2  
 Packing Group II

**15. Regulatory information**

**International Inventories**

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Zinc powder - zinc dust (pyrophoric)	X	X	-	231-175-3	-		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**

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Zinc powder - zinc dust (pyrophoric)	7440-66-6	100	1.0

**SARA 311/312 Hazard Categories** See section 2 for more information

### **CWA (Clean Water Act)**

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Zinc powder - zinc dust (pyrophoric)	-	-	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
Zinc powder - zinc dust (pyrophoric)	1000 lb	-

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

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

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Zinc powder - zinc dust (pyrophoric)	X	X	X	-	X

### **U.S. Department of Transportation**

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

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

This product does not contain any DHS chemicals.

### **Other International Regulations**

**Mexico - Grade** No information available

## 16. Other information

**Prepared By** Regulatory Affairs  
Thermo Fisher Scientific



Email: EMSDS.RA@thermofisher.com

<b>Creation Date</b>	02-Jun-2010
<b>Revision Date</b>	18-Jan-2018
<b>Print Date</b>	18-Jan-2018
<b>Revision Summary</b>	This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

**Disclaimer**

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

**End of SDS**

**Appendix E:**  
Accident Report Form

# Employee Accident Report

## EMPLOYEE

Name \_\_\_\_\_ SS# \_\_\_\_\_ Emp ID# \_\_\_\_\_

Home Address \_\_\_\_\_

Sex: M F Birth Date \_\_\_\_\_ Street \_\_\_\_\_ city \_\_\_\_\_ zip code \_\_\_\_\_ phone \_\_\_\_\_  
Age: \_\_\_\_\_ Employment Status: Full time \_\_\_\_\_ Part time \_\_\_\_\_ % \_\_\_\_\_

Job Title \_\_\_\_\_ Time in Present Position \_\_\_\_\_ Yrs \_\_\_\_\_ Months \_\_\_\_\_

Department \_\_\_\_\_ Work Address \_\_\_\_\_

Supervisor \_\_\_\_\_ building/room # \_\_\_\_\_ phone \_\_\_\_\_

Supervisor name \_\_\_\_\_ building/room # \_\_\_\_\_ phone \_\_\_\_\_

Accident Date \_\_\_\_\_ Time \_\_\_\_\_ am/pm Location \_\_\_\_\_

What were you doing and using (tools, chemicals, equipment, etc.) when the accident occurred? Describe what happened.

Was this part of your normal job duty? \_\_\_\_\_ Yes \_\_\_\_\_ No \_\_\_\_\_

Parts of body affected or injured \_\_\_\_\_

Witnesses: \_\_\_\_\_ / \_\_\_\_\_

Report prepared by (if different from the injured employee) \_\_\_\_\_ name \_\_\_\_\_ phone \_\_\_\_\_

\_\_\_\_\_ name \_\_\_\_\_ phone \_\_\_\_\_

*I understand that it is my right to apply for Workers' Compensation benefits and that I have two years from the date of this accident to do so. For more information regarding workers' compensation, call the New York State Department of Labor. I also authorize release of medical information regarding this accident to the Prime Contractors claim administrators.*

EMPLOYEE SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_

## SUPERVISOR/CHARGE PERSON

This accident was reported to me on \_\_\_\_\_ at \_\_\_\_\_ Cost Center/Dept # \_\_\_\_\_

(date) (time)

IS FURTHER INVESTIGATION REQUIRED? \_\_\_\_\_ Yes \_\_\_\_\_ No \_\_\_\_\_

Supervisor/Charge Person Signature \_\_\_\_\_ Date \_\_\_\_\_

## HEALTH CARE PROVIDER

Treated by: \_\_\_\_\_

print name \_\_\_\_\_ signature \_\_\_\_\_

Address \_\_\_\_\_

name of facility \_\_\_\_\_ street \_\_\_\_\_ city \_\_\_\_\_ state \_\_\_\_\_ zip code \_\_\_\_\_ phone \_\_\_\_\_

Hospitalized overnight as inpatient? \_\_\_\_\_ yes \_\_\_\_\_ no (if emergency room only mark no)

Diagnosis/Assessment \_\_\_\_\_

Parts of body affected \_\_\_\_\_

Reaggravation of previous work injury? \_\_\_\_\_ yes \_\_\_\_\_ no Date of initial injury \_\_\_\_\_

# **NYSDEC BROWNFIELD CLEANUP PROGRAM**

**Community Air Monitoring Plan – BCP # C224329**

**June 13, 2022**

*conducted at:*

**585 Union Street  
577-599 Union Street (also known as 586 Sackett Street)  
Brooklyn, New York  
County Tax Map Designation: Block 433; Lot 28**

*Submitted to:*

**Division of Environmental Remediation  
New York State Department of Environmental Conservation  
625 Broadway  
Albany, New York, 12233-7020**

*Prepared For:*

**Gowanus Union Street LLC  
19 West 24<sup>th</sup> Street, 12<sup>th</sup> Floor  
New York, NY, 10010**

**IEC Project # 14729**



**IMPACT ENVIRONMENTAL ENGINEERING AND GEOLOGY, PLLC**

170 Keyland Court | Bohemia | New York | 11716 | 631.269.8800

## TABLE OF CONTENTS

Section	Topic	Page
	LIST OF ACRONYMS .....	2
	CERTIFICATION .....	3
1	INTRODUCTION .....	4
1.1	Objectives .....	4
2	MONITORING .....	5
2.1	Community Air Monitoring Plan .....	5
2.2	VOC Monitoring, Response Levels, and Actions .....	5
2.3	Particulate Monitoring, Response Levels, and Actions .....	6
2.4	Meteorological Monitoring .....	7
3	DOCUMENTATION .....	8
<b>APPENDICES</b>		
APPENDIX A	CAMP DIALY STATUS REPORT SHEET	
APPENDIX B	ON-SITE DUST AND VOLATILE ORGANIC VAPOR MONITORING LOG	

## LIST OF ACRONYMS

<b>Acronym</b>	<b>Definition</b>
DER	Division of Environmental Remediation
CAMP	Community Air Monitoring Unit
Mcg/m <sup>3</sup>	Micrograms Per Cubic Meter
NYS DEC	New York State Department of Environmental Conservation
NYS DOH	New York State Department of Health
PID	Photoionization Detector
PM-10	Particulate Matter Less Than 10 Micrometers in Size
PPM	Parts Per Million
VOC	Volatile Organic Compound

**CERTIFICATION**

I, Xin Yuan am a Professional Engineer (PE) as defined in §43-140. I have primary direct responsibility for implementation of the Community Air Management Plan (CAMP) for the (585 Union Street, Brooklyn, NY) Site (DEC Site # C224329).

I certify that the CAMP has a plan for handling the prevention of exposure to the public from potential contaminant releases resulting from on-site investigative or remedial activities.

Xin Yuan, P.E.

Name

Signature:

*Xin Yuan*

6-13-2022

Date:



## **1 INTRODUCTION**

Impact Environmental Engineering and Geology, PLLC (IEEG) prepared this Community Air Monitoring Plan (CAMP) to protect the community from the potential airborne releases that could result from field activities associated with construction activities for development (foundation installations, support of excavation, etc.) or remediation activities (remedial investigations or remedial action) at the property located at 577-599 Union Street, Brooklyn, New York, herein referred to as the "Site". This work is being performed under the auspices of the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program, DEC Project # C224329. This document has been prepared in accordance with the NYSDEC Program Policy Division of Environmental Remediation (DER)-10/Technical Guidance for Site Investigation and Remediation, dated May 3, 2010.

The CAMP is intended to protect off-site receptors and those not directly involved with remedial activities from potential airborne contaminant releases that result directly from investigative or remedial activities.

### **1.1 Objectives**

The overall objectives of this document are as follows:

- Prevent exposure to the public from potential contaminant releases resulting from on-site investigative or remedial activities;
- Specify monitoring and documentation requirements; and
- Provide contingency details.



## **2 MONITORING**

### **2.1 Community Air Monitoring Plan**

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

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

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

VOCs will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis during invasive work. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work will be performed using a photoionization detector (PID). The PID will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment will be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

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

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

All 15-minute readings must be recorded and be available for DEC personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.

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

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

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m<sup>3</sup>) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m<sup>3</sup> above the upwind level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m<sup>3</sup> above the upwind level, work will be stopped and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m<sup>3</sup> of the upwind level and in preventing visible dust migration.

## **2.4 Meteorological Monitoring**

Meteorological monitoring will take place on a daily basis. It will consist of temperature, wind direction, and general atmospheric conditions (i.e. rain, snow, etc.). These parameters will be evaluated each morning and recorded in the field notebook. Wind direction should be monitored throughout the day so that upwind and downwind sampling locations can be adjusted if necessary.

All readings will be recorded and be available for DEC personnel to review.

### **3 DOCUMENTATION**

During the implementation of the CAMP, the following information will be recorded and maintained:

- Climatological conditions including temperature wind direction, and other atmospheric conditions along with the date and time of observations;
- Calibration of field instruments;
- VOC 15-min readings as well as instantaneous readings, if necessary; All particulate readings; and
- Any exceedances to the response levels and the respective corrective actions.

VOC 15-min readings will be available for review by the State (DEC and NYSDOH) if requested. All particulate readings will be made available for review if requested.

## **APPENDICES**

585 Union Street, Brooklyn, New York



**APPENDIX A**  
**CAMP Daily Status Report Sheet**  
585 Union Street, Brooklyn, New York





**DAILY STATUS REPORT**

WEATHER	Snow	Rain	Overcast	Partly Cloudy	Bright Sun
TEMP.	< 32	32-50	50-70	70-85	> 85

Prepared by: \_\_\_\_\_

DEC Project. No.	DEC Site No.	Date:
Project Name:		

<b>Environmental Consultant:</b> Impact Environmental Closures, Inc 170 Keyland Court Bohemia, NY 11716.	<b>Environmental Safety Officer:</b>
<b>General Contractor:</b>	<b>Site Manager/ Supervisor:</b>

<b>Work Activities Performed (Since Last Report)</b>
<b>Working In Area:</b>

<b>Samples Collected (Since Last Report):</b>
<b>Air Monitoring (Since Last Report):</b> Prestart Conditions – PID = __0.0__ ppm, Dust = _____ mg/m <sup>3</sup> @ High Conditions – PID = __0.0__ ppm @ Dust = __mg/m <sup>3</sup> @
<b>Problems Encountered:</b>
<b>Planned Activities for the Next Day/ Week:</b>

### SOIL DISPOSAL INFORMATION

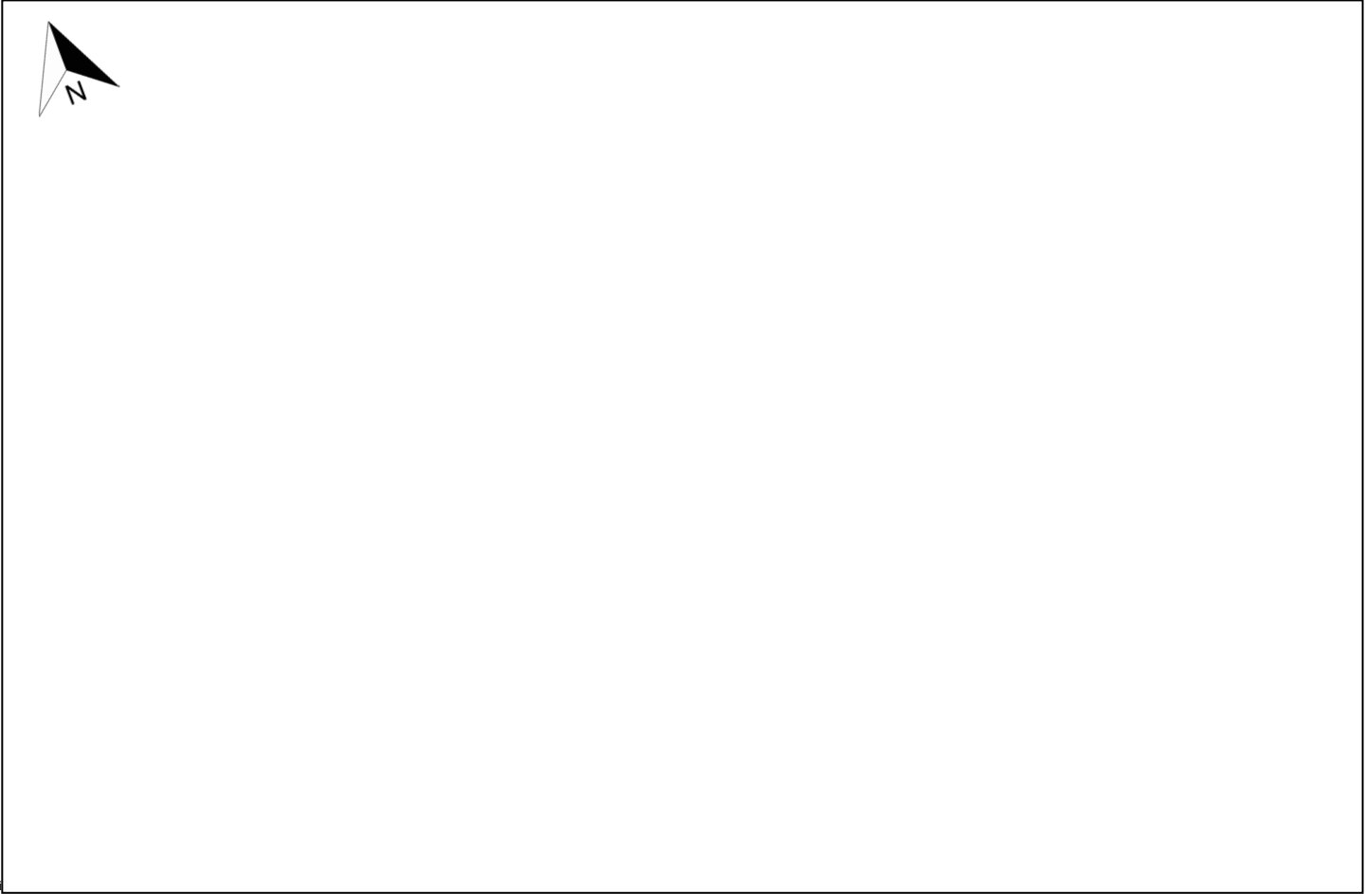
<b>Facility #: Name/ Location: Type of Waste:</b>	Facility:		Facility:		Facility:	
	Trucks	Cu. Yds.	Trucks	Cu. Yds.	Trucks	Cu. Yds.
<b>(# of Trucks, # of Cu.Yds.)</b>						
<b>Today</b>						
<b>Weekly Total</b>						
<b>Total to Date</b>						

### SOIL IMPORTED INFORMATION

<b>Facility #: Name/ Location: Type of Import:</b>	Facility:		Facility:		Facility:	
	Trucks	Cu. Yds.	Trucks	Cu. Yds.	Trucks	Cu. Yds.
<b>(# of Trucks, # of Cu.Yds.)</b>						
<b>Today</b>						
<b>Weekly Total</b>						
<b>Total to Date</b>						



Site Grid Map



**Photo Log**

**Photo 1 –**

**Photo 2-**

**Photo 3 –**

---

**APPENDIX B**  
**On-site Dust and Volatile Organic Vapor Monitoring**  
**Log**  
585 Union Street, Brooklyn, New York



## On- Site Dust and Volatile Organic Vapor Monitoring

Project: _____	Job No.: _____	
Location: _____	On-site Personnel: _____	
Day & Date: _____	Weather: _____	
AM	PM	Sample Interval: 15 minutes
Wind Direction		Background Reading (particulates) <b>mg/m<sup>3</sup></b>
Temperature Range:	°F	Background Reading (organic vapors) <b>ppm</b>
Calibration Dates:	Particulate Meters: _____	Photoionization Detector: _____
Action	Organic vapors: > 5ppm above background levels/ 15 minute readings	
Level/Response:	Particulates: 0.100 mg/m <sup>3</sup> above up wind reading/15 minute period	

Time	Particulate levels:		ORGANIC VAPOR LEVELS (ppm)	NOTES
	UPWIND (mg/m <sup>3</sup> )	DOWNWIND (mg/m <sup>3</sup> )		
0700				
0715				
0730				
0745				
0800				
0815				
0830				
0845				
0900				
0915				
0930				
0945				
1000				
1015				
1030				
1045				
1100				
1115				
1130				
1145				
1200				

Project: \_\_\_\_\_

Job No.: \_\_\_\_\_

Location: \_\_\_\_\_

Day & Date: \_\_\_\_\_

Time	Particulate levels:		ORGANIC VAPOR LEVELS (ppm)	NOTES
	UPWIND (mg/m <sup>3</sup> )	DOWNWIND (mg/m <sup>3</sup> )		
1215				
1230				
1245				
1300				
1315				
1330				
1345				
1400				
1415				
1430				
1445				
1500				
1515				
1530				
1545				
1600				
1615				
1630				
1645				
1700				

# Appendix 7

QAPP

Site Management Plan  
NYSDEC BCP #C224329



IMPACT ENVIRONMENTAL  
170 Keyland Court  
Bohemia, New York 11716  
TEL: (631) 268-8800  
FAX: (631) 269-1599

# **QUALITY ASSURANCE PROJECT PLAN**

September 28, 2021

*Submitted for:*

**585 Union Street  
577-599 Union Street (also known as 586 Sackett Street)  
Brooklyn, New York  
County Tax Map Designation: *Block 433; Lot 28***

*Submitted to:*

**New York State Department of Environmental Remediation, Region 2  
Division of Environmental Remediation  
625 Broadway  
Albany, New York 12233-7016**

*Report user:*

**Gowanus Union Street LLC  
19 West 24<sup>th</sup> Street, 12<sup>th</sup> Floor  
New York, NY, 10010**

***Project Number:***

**14729**



**IMPACT ENVIRONMENTAL** | 170 Keyland Court | Bohemia | New York | 11716 | 631.269.8800



## TABLE OF CONTENTS

Section	Topic	Page
1	INTRODUCTION.....	1
1.1	Scope and Goals .....	1
1.2	Cleanup Criteria and Laboratory Reporting Limits .....	2
2	QAPP ORGANIZATION AND RESPONSIBILITY .....	3
2.1	<i>NYSDEC and NYSDOH</i> .....	3
2.2	<i>Applicant</i> .....	3
2.3	<i>Environmental Consultant</i> .....	4
2.4	<i>Quality Assurance (QA) Responsibilities</i> .....	5
2.5	<i>Field Responsibilities</i> .....	6
3	QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA .....	6
3.1	<i>Level of QC Effort for Sample Parameters</i> .....	6
4	SAMPLING AND ANALYSIS PLAN.....	7
4.1	Custody Procedures .....	7
4.2	Sample Storage .....	8
4.3	Sample Custody .....	8
4.4	Sample Tracking .....	9
4.5	Field Instrument Calibration .....	9
4.5.1	<i>Instrument Calibration and Tuning</i> .....	9
4.5.2	<i>Field Instrument Calibration</i> .....	9
4.6	Analytical Procedures .....	10
4.7	Data Usability Evaluation.....	11
4.7.1	<i>Procedures Used to Evaluate Data Usability</i> .....	11
4.7.2	<i>Data Usability Summary Report (DUSR)</i> .....	12

## TABLES

**Table 1:** Summary of the Proposed Samples and Analyses

**Table 2:** Summary of Sample Parameters, Holding Times and Sample Container Requirements

## APPENDICES

**Appendix A:** Key Project Personnel Resumes

**Appendix B:** Project QA Officer Resume

- Appendix C:** Project Personnel Resumes
- Appendix D:** Field Operating Procedures
- Appendix E:** Alpha Analytical Parameter Summary Tables
- Appendix F:** Alpha Analytical SOP for PFAS Analysis
- Appendix G:** Third Party Data Validator

## 1 INTRODUCTION

Impact Environmental Closures, Inc. (IEC) was retained by Gowanus Union Street LLC to prepare a Remedial Investigation Work Plan (RIWP) as part of the Brownfield Cleanup Program (BCP) for Site C224329, located at 577-599 Union Street (also known as 586 Sackett Street), Brooklyn, New York in accordance with the provisions of the New York State Department of Environmental Conservation's (NYSDEC) Subpart 375-3.

This Quality Assurance Project Plan (QAPP) provides an outline of the field and laboratory procedures that will be used during the Remedial Investigation (RI) activities proposed for the Site. The QAPP is used to ensure the data it collects and analyzes meets project requirements.

The QAPP will assure the accuracy and precision of data collection during the Site characterization and data interpretation periods. The QAPP identifies procedures for sample collection to mitigate the potential for cross-contamination, as well as analytical requirements necessary to allow for independent data validation. A Sampling and Analysis Plan (SAP) identifying methods for sample collection, decontamination, handling and shipping, is provided in the following sections.

This QAPP has been prepared in accordance with USEPA's Requirements for Quality Assurance Project Plans for Environmental Data Operations; the EPA Region II CERCLA Quality Assurance Manual, and NYSDEC's DER-10 Technical Guidance for Site Investigation and Remediation (May 2010).

### 1.1 Scope and Goals

This QAPP has been prepared to support the remedial investigation activities planned for the Site. The goals of the RI are to document the nature and extent of soil, soil vapor and groundwater contamination, update the current Conceptual Site Model (CSM) including potential exposure pathways, and collect data to support determination of a remedy(ies). This QAPP was prepared to provide quality assurance (QA) guidelines to be implemented during the RI activities to fulfill the RI goals for the Site. This document may be modified for subsequent phases of investigative work, as necessary. The QAPP provides:

- A means to communicate to the individuals executing the various activities exactly what is to be done, by whom, and when.
- A culmination to the planning process that ensures that the program includes provisions for obtaining quality data (e.g., suitable methods of field operations).
- A historical record that documents the investigation in terms of the methods used, calibration standards and frequencies planned, and auditing planned.
- A document that can be used by the Project Manager's and QA Officer to assess if the ac-

tivities planned are being implemented and their importance for accomplishing the goal of quality data.

- A plan to document and track project data and results.
- Detailed descriptions of the data documentation materials and procedures, project files, and tabular and graphical reports.

The QAPP is primarily concerned with the quality assurance (QA) and quality control (QC) aspects of the procedures involved in the collection, preservation, packaging, and transportation of samples; field testing; record keeping; data management; chain-of-custody procedures; laboratory analyses; and other necessary matters to assure that the investigation activities, once completed, will yield data whose integrity can be defended.

QA refers to the conduct of all planned and systematic actions necessary to perform satisfactorily all task-specific activities and to provide information and data confidence as a result of such activities. The QA for task-specific activities includes the development of procedures, auditing, monitoring and surveillance of the performance.

QC refers to the activity performed to determine if the work activities conform to the requirements. This includes activities such as inspections of the work activities in the field (e.g., verification that the items and materials installed conform to applicable codes and design specifications). QA is an overview monitoring of the performance of QC activities through audits rather than first time inspections.

## 1.2 Cleanup Criteria and Laboratory Reporting Limits

The following cleanup criteria for soil and groundwater that will be used for evaluation of the full TAL/TCL sampling analytical data collected as part of the RI are as follows:

Soil:	6 NYCRR Part 375 Restricted-Residential Soil Cleanup Objectives (SCOs) listed in Table 375-6.8(a), Protection of Public Health Restricted Use SCOs and the Protection of Groundwater SCOs listed in Table 375-6.8(b).
Groundwater:	6 NYCRR Part 703 Groundwater Quality Standards and the NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values.

The following criteria will be used for evaluation of the soil vapor sample analytical data collected as part of the RI are as follows:

Soil Vapor:	NYSDOH Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York and Subsequent Final Guidance Updates Air Guidance Values and Matrices.
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For the emerging contaminants 1,4-Dioxane, and Per/Polyfluoroalkyl substances (PFAS), the New York State Department of Environmental Conservation (NYSDEC) and the New York State Department of Health (NYSDOH), in accordance to the recommendation of the New York State Drinking Water Council, are adopting drinking water

maximum contaminant levels (MCLs) of 10 parts per trillion (ppt) for PFAS Substances and 1 part per billion (ppb) for 1,4-Dioxane (effective December 18, 2018). No soil cleanup standards have been established in New York State. Soil vapor sampling for 1,4-Dioxane and PFAS is not required.

The environmental analytical laboratory selected for this RI must have reporting limits that are low enough to meet the above referenced cleanup standards. As part of project planning and throughout the project life cycle, the environmental consultant will maintain close communications with the contracted laboratory to convey the necessity for establishing and achieving data reporting goals. Additional information regarding the contracted lab and reporting limits are provided in Section 4.6.

## **2 QAPP ORGANIZATION AND RESPONSIBILITY**

The principal organizations involved in verifying achievement of data collection goals for the Site include: the NYSDEC, NYSDOH, Applicant, Consultant, drilling subcontractor(s), independent environmental laboratory and the independent third party data validator. Roles, responsibilities, and required qualifications of these organizations are discussed in the following subsections.

### **2.1 NYSDEC and NYSDOH**

It is the responsibility of the NYSDEC, in conjunction with NYSDOH, to review the RIWP and supporting documents, for completeness and conformance with the site-specific cleanup objectives and to make a decision to accept or reject these documents based on this review. The NYSDEC also has the responsibility and authority to review and approve all QA documentation collected during brownfield cleanup construction and to confirm that the QA Plan was followed.

### **2.2 Applicant**

Gowanus Union Street LLC (“Applicant”) will be responsible for complying with the QA requirements as specified herein and for monitoring and controlling the quality of the Brownfield cleanup construction either directly or through their designated environmental consultant and/or legal counsel. The Applicant will also have the authority to select Remedial Action Contractor(s) to assist them in fulfilling these responsibilities. The designated Project Manager is responsible for implementing the project, and has the authority to commit the resources necessary to meet project objectives and requirements.

### 2.3 Environmental Consultant

IEC is the prime consultant on this project and is responsible for the performance of the services required to implement each phase of the RI Work Plan, including, but not limited to, field operations, laboratory testing, data management, data analysis and reporting. Any one member of IEC's staff may fill more than one of the identified project positions (e.g., field team leader and site safety and health officer). The various quality assurance, field, laboratory and management responsibilities of key project personnel are defined below and the resumes are provided in **Appendix A**.

IEC Project Manager (PM): Kevin Kleaka

The IEC PM has the responsibility for ensuring that the project meets the Work Plan objectives. The PM will report directly to the Gowanus Union Street LLC's Project Coordinator and the NYSDEC/NYSDOH Project Coordinators and is responsible for technical and project oversight. The PM will:

- Define project objectives and develop a detailed work plan schedule.
- Establish project policy and procedures to address the specific needs of the project as a whole, as well as the objectives of each task.
- Acquire and apply technical and corporate resources as needed to assure performance within budget and schedule constraints.
- Develop and meet ongoing project and/or task staffing requirements, including mechanisms to review and evaluate each task product.
- Review the work performed on each task to assure its quality, responsiveness, and timeliness.
- Review and analyze overall task performance with respect to planned requirements and authorizations.
- Review and approve all deliverables before their submission to NYSDEC.
- Develop and meet ongoing project and/or task staffing requirements, including mechanisms to review and evaluate each task product.
- Ultimately be responsible for the preparation and quality of interim and final reports.
- Represent the project team at meetings.

IEC Field Team Leader (FTL): Manan Dalal

The Field Team Leader (FTL) has the responsibility for implementation of specific project tasks identified at the Site, and is responsible for the supervision of project field personnel, subconsultants, and subcontractors. The FTL reports directly to the Project Manager. The FTL will:

- Define daily work activities.
- Orient field staff concerning the project's special considerations.
- Monitor and direct subcontractor personnel.
- Review the work performed on each task to ensure its quality, responsiveness, and timeliness.
- Assure that field activities, including sample collection and handling, are carried out in accordance with this QAPP.

For this project the FTL will also serve as the Site Safety and Health Officer (SSHO). As such, he is responsible for implementing the procedures and required components of the Site Health and Safety Plan (HASp), determining levels of protection needed during field tasks, controlling site entry/exit, briefing the field team and subcontractors on site-specific health and safety issues, and all other responsibilities as identified in the HASp.

IEC Field Personnel (FS):

The field personnel hold a minimum of a bachelor's degree in a relevant natural or physical science or engineering. The field personnel will complete the collection of environmental samples from the Site in accordance with the requirements of the remedial investigation work plan and the QAPP, and oversee subcontractor work. The field personnel will:

- Implement sample collection protocols in accordance with applicable procedures for soil, soil vapor and groundwater sample collection.
- Ensure quality control procedures are being implemented.
- Ensure adherence to and successful completion of RIWP tasks.
- Oversee subcontractors to ensure field work is completed in accordance with the RAWP and QAPP.
- Record field notes and provide daily updates on work progress.

## **2.4 Quality Assurance (QA) Responsibilities**

The QA Officer will have direct access to corporate executive staff as necessary, to resolve any QA dispute, and is responsible for auditing the implementation of the QA program in conformance with the demands of specific investigations and IEC policies, and NYSDEC requirements. The QA Officer has sufficient authority to stop work on the investigation as deemed necessary in the event of serious QA issues. The resume for the QA Officer is provided in **Appendix B**.

IEC Project QA Officer: Diana Posten

Specific function and duties include:

- Performing QA audits on various phases of the field operations
- Reviewing and approving QA plans and procedures

- Providing QA technical assistance to project staff
- Reporting on the adequacy, status, and effectiveness of the QA program on a regular basis to the Project Manager for technical operations
- Responsible for assuring third party data review of all sample results from the analytical laboratory

## **2.5 Field Responsibilities**

IEC field staff for this project is drawn from a pool of qualified resources. The Project Manager will use staff to gather and analyze data, and to prepare various task reports and support materials. The designated technical team members are experienced professionals who possess the degree of specialization and technical competence required to effectively and efficiently perform the required work. The resumes for field personnel is provided in **Appendix C**.

## **3 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA**

The overall objectives and criteria for assuring quality for this effort are discussed below. This QAPP addresses how the acquisition and handling of samples and the review and reporting of data will be documented. The objectives of this QAPP are to address the following:

- The procedures to be used to collect, preserve, package, and transport groundwater samples.
- Field data collection.
- Record keeping.
- Data management
- Chain-of-custody procedures.
- Precision, accuracy, completeness, representativeness, decision rules, comparability and level of quality control effort conformance for sample analysis and data management by Alpha Analytical under EPA analytical methods.

### **3.1 Level of QC Effort for Sample Parameters**

Field blank, method blank, trip blank, field duplicate, laboratory duplicate, laboratory control, standard reference materials (SRM) and matrix spike samples will be analyzed to assess the quality of the data resulting from the field sampling and analytical programs. QC samples are discussed below.

- Field and trip blanks consisting of distilled water will be submitted to the analytical laboratories to provide the means to assess the quality of the data resulting from the field-sampling program. Field (equipment) blank samples are analyzed to check for procedural



chemical constituents at the facility that may cause sample contamination. Trip blanks are used to assess the potential for contamination of samples due to contaminant migration during sample shipment and storage.

- Method blank samples are generated within the laboratory and used to assess contamination resulting from laboratory procedures.
- Duplicate samples are analyzed to check for sampling and analytical reproducibility.
- MS/MSD and MS/Duplicate samples provide information about the effect of the sample matrix on the digestion and measurement methodology. Depending on site-specific circumstances, one MS/MSD or MS/Duplicate should be collected for every 20 or fewer investigative samples to be analyzed for organic and inorganic chemicals of a given matrix.

The general level of QC effort will be one field (blind) duplicate and one field blank (when non-dedicated equipment is used) for every 20 or fewer investigative samples of a given matrix. Additional sample volume will also be provided to the laboratory to allow site-specific MS/MSD or MS/Duplicate for every 20 or fewer investigative samples of a given matrix. One trip blank consisting of distilled, deionized water will be included along with each sample delivery group of aqueous VOC samples.

#### **4 SAMPLING AND ANALYSIS PLAN**

The selection and rationale for the RI sampling program is discussed in the RIWP. Methods and protocol to be used to collect environmental samples (i.e., soil vapor, soil and groundwater) for this investigation are described in the IEC Field Operating Procedures (FOPs) presented in **Appendix D**.

The number and types of environmental samples to be collected are summarized in **Table 1**. Sample parameter lists, holding times and sample container requirements are summarized in **Table 2**. The sampling program and related site activities are discussed below. To the extent allowed by existing physical conditions at the facility, sample collection efforts will adhere to the specific methods presented herein. If alternative sampling locations or procedures are implemented in response to facility specific constraints, each will be selected on the basis of meeting data objectives. Such alternatives will be approved by NYSDEC before implementation and subsequently documented for inclusion in the project file.

##### **4.1 Custody Procedures**

Sample custody is controlled and maintained through the chain-of-custody procedures. Chain of custody is the means by which the possession and handling of samples will be tracked from the source (field) to their final dispo-

sition, the laboratory. A sample is considered to be in a person's custody if it is in the person's possession or it is in the person's view after being in his or her possession or it was in that person's possession and that person has locked it in a vehicle or room. Sample containers will be cleaned and preserved at the laboratory before shipment to the Site. The following section and FOPs for Sampling, Labeling, Storage, and Shipment, located in Appendix B, describe procedures for maintaining sample custody from the time samples are collected to the time they are received by the analytical laboratory.

#### **4.2 Sample Storage**

Samples are stored in secure limited-access areas. Walk-in coolers or refrigerators are maintained at 4°C, 2°C, or as required by the applicable regulatory program. The temperatures of all refrigerated storage areas are monitored and recorded a minimum of once per day. Deviations of temperature from the applicable range require corrective action, including moving samples to another storage location if necessary.

#### **4.3 Sample Custody**

Sample custody is defined by this document as when any of the following occur:

- It is in someone's actual possession.
- It is in someone's view after being in his or her physical possession.
- It was in someone's possession and then locked, sealed or secured in a manner that prevents unsuspected tampering.
- It is placed in a designated and secured area.

Samples are removed from storage areas by the sample custodian or analysts and transported to secure laboratory areas for analysis. Access to the laboratory and sample storage areas is restricted to laboratory personnel and escorted visitors only; all areas of the laboratory are therefore considered secure. If required by the applicable regulatory program, internal chain-of-custody is documented in a log by the person moving the samples between laboratory and storage areas.

Laboratory documentation used to establish COC and sample identification may include the following:

- Field COC forms or other paperwork that arrives with the sample.
- The laboratory COC.
- Sample labels or tags are attached to each sample container.
- Sample custody seals.
- Sample preparation logs (i.e., extraction and digestion information) recorded in hardbound laboratory books that are filled out in legible handwriting, and signed and dated by the chemist.

- Sample analysis logs (e.g., metals, GC/MS, etc.) information recorded in hardbound laboratory books that are filled out in legible handwriting, and signed and dated by the chemist.
- Sample storage log (same as the laboratory COC).
- Sample disposition log, which documents sample disposal by a contracted waste disposal company.

#### **4.4 Sample Tracking**

All samples are maintained in the appropriate coolers prior to and after analysis. The analysts remove and return their samples as needed. Samples that require internal COC are relinquished to the analysts by the sample custodians. The analyst and sample custodian must sign the original COC relinquishing custody of the samples from the sample custodian to the analyst. When the samples are returned, the analyst will sign the original COC returning sample custody to the sample custodian. Sample extracts are relinquished to the instrumentation analysts by the preparatory analysts. Each preparation department tracks internal COC through their log-books/spreadsheets. Any change in the sample during the time of custody will be noted on the COC (e.g., sample breakage or depletion).

#### **4.5 Field Instrument Calibration**

This section describes the calibration procedures and the frequency at which these procedures will be performed for instruments.

##### **4.5.1 Instrument Calibration and Tuning**

Calibration of instrumentation is required to ensure that the analytical system is operating correctly and functioning at the proper sensitivity to meet established reporting limits. Each instrument is calibrated with standard solutions appropriate to the type of instrument and the linear range established for the analytical method. The frequency of calibration and the concentration of calibration standards is determined by the manufacturer's guidelines, the analytical method, and/or laboratory's internal Quality Assurance Plan.

##### **4.5.2 Field Instrument Calibration**

Calibration of the field instruments will be completed prior to each day's use in accordance with the manufacturer's instructions. The field equipment will be maintained, calibrated and operated in a manner consistent with the manufacturer's guidelines and standard use methods. Quantitative field measurements will be limited to organic vapor readings (Photoionization Detector); pH, conductivity, turbidity, specific conductance, temperature, dissolved oxygen (Horiba); and depth to water (interface probe). The calibration procedures will be conducted at a minimum frequency of once per day with the exception of the interface probe which does not require calibration. Records of calibration, repair or replacement will be filed and maintained by the Field Team Leader.

#### 4.6 Analytical Procedures

A single laboratory will be utilized for analysis of the soil, soil vapor and groundwater samples collected during the RI field sampling activities. The selected analytical laboratory for this project is Alpha Analytical of Westborough, Massachusetts. Alpha is certified by the NYSDOH Environmental Laboratory Approval Program (ELAP) Number 11148. The laboratory analyses will be in accordance with the most recent version of the NYSDEC Analytical Services Protocol (ASP) and the laboratory's internal Quality Assurance Plan. The lab will provide a Category B data deliverable.

The analytical methods Alpha will use for samples collected to delineate contaminants during this RI include:

Analytical Methods for Soil Samples	
USEPA Method 8260C/5035	Target Compound List (TCL) Volatile Organic Compounds (VOCs) + Tentatively Identified Compounds (TICs)
USEPA Method 8270D	TCL Semi Volatile Organic Compounds (SVOCs)+ TICs
USEPA Method 537 (M) – Isotope Dilution	NY List PFAS
USEPA 8270D-SIM	1,4-Dioxane
USEPA 8082A	TCL Polychlorinated biphenyls (PCBs)
USEPA 80818	TCL Pesticides
7196A	Hexavalent Chromium
9010C/9012B	Total Cyanide
6010D	TAL Metals
7471B	Total Mercury

Analytical Methods for Soil Vapor Samples	
TO-15	VOCs

Analytical Methods for Groundwater/Aqueous Samples	
USEPA Method 8260C	TCL VOCs + TICs
USEPA Method 8270D	TCL SVOCs + TICs
USEPA Method 537 (M) – Isotope Dilution	NY List PFAS
USEPA 8270D-SIM	1,4-Dioxane

Analytical Methods for Groundwater/Aqueous Samples	
USEPA 8082A (LVI)	TCL PCBs
USEPA 8082B	TCL Pesticides
7196A	Hexavalent Chromium
9010C/9012B	Total Cyanide
6020B	TAL Metals
7470A	Total Mercury

All other reporting and deliverables (i.e. waste characterization samples, geochemistry data for remedial action evaluation) will be in accordance with Standard Laboratory Procedure.

Alpha has provided a series of tables that contain the analytical parameters for soil, soil vapor and ground water, with the applicable reporting limits, method detection limits, containers and hold times. The Alpha tables are provided in **Appendix E**. Alpha has also provided the SOP for the PFAS analysis which is provided in **Appendix F**.

#### 4.7 Data Usability Evaluation

The analytical laboratory data package will be validated by Linda Wright with Environmental Data Validation, Inc. of Pittsburgh, PA (EDV, Inc.), an independent/third-party data validator subcontractor, in accordance with the NYSDEC Division of Environmental Remediation DER-10, Appendix 2B(b) DEC Analytical Services Protocol Category B Data Deliverable. Refer to **Appendix G** for resume of the third-party data validator.

##### 4.7.1 Procedures Used to Evaluate Data Usability

The sample analytical data for each sample matrix shall be evaluated and include, but are not limited to:

- Lab Report Narrative Review
- Data Package Completeness and COC records
- Sample Preservation and Holding Times
- Initial and Continuing Calibration
- QC Blanks
- Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD)
- Matrix Spike/Matrix Spike Duplicates (MS/MSD)
- Surrogate Spikes
- Internal Standard Response and Retention Times
- Laboratory Duplicates
- Field Duplicates
- Raw Data (chromatograms), Calculation Checks and Transcription Verifications
- Reporting Limits

#### 4.7.2 Data Usability Summary Report (DUSR)

The DUSR will provide an evaluation of the analytical data to determine whether the data meets the criteria of a NYSDEC ASP Category B data deliverable and meets the data quality objectives for the project.

**Table 1: Summary of the Proposed Samples and Analyses**

**Table 1. Remedial Investigation Analytical Program Summary  
585 Union Street, Brooklyn, New York**

Sample Media	Number of Samples and QA/QC Blanks					Analyses
	Estimated Field Samples	Duplicates	MS/MSD Samples	Field Blanks	Trip Blanks	
Soil Vapor	4	1	0	0	0	VOCs USEPA Method TO-15
Shallow Soil Samples	14	1/20 samples	1/20 samples	1/day minimum, 1/20 samples	1/Cooler Containing Volatiles	TCL VOCs plus TICs, TCL SVOCs plus TICs, TCL PCBs, TCL Pesticides, TAL Metals, Total Cyanide, Hexavalent Chromium, NYSDEC PFAS Analyte List and 1,4-dioxane
Deep Soil Samples	14	1/20 samples	1/20 samples	1/day minimum, 1/20 samples	1/Cooler Containing Volatiles	TCL VOCs
Groundwater Samples Permanent Wells	8	1/20 samples	1/20 samples	1/day minimum, 1/20 samples	1/Cooler Containing Volatiles	TCL VOCs plus TICs, TCL SVOCs plus TICs, TCL PCBs, TCL Pesticides, TAL Metals, Total Cyanide, Hexavalent Chromium, NYSDEC PFAS Analyte List and 1,4-dioxane

**NOTES:**

MS = Matrix Spike  
MSD = Matrix Spike Duplicate  
TAL = Target Analyte List  
TCL = Target Compound List  
VOCs = Volatile Organic Compounds

SVOCs = Semi Volatile Organic Compounds  
TICs - Tentatively Identified Compounds  
PCBs - Polychlorinated Biphenyls  
PFAS - Per and Polyfluoroalkyl Substances



**Table 2: Summary of Sample Parameters, Holding Times and Sample Container Requirements**

**Table 2. Summary of Sample Parameters, Holding Times and Sample Container Requirements  
585 Union Street, Brooklyn, New York**

<b>Sample Matrix</b>	<b>Test Method</b>	<b>Parameters</b>	<b>Containers</b>	<b>Preservation</b>	<b>Holding Times</b>
Soil - Gas (air) Analysis	USEPA Compendium TO-15	VOCs	6-Liter Summa Canister	Summa - NA	15 Days
Soil	USEPA SW846 Method 5035A/8260C	TCL VOC+TICs	Terra Core	Water, 4 °C	48 Hours/14 Days*
	USEPA SW846 Method 5035A/8260C	CP-51 List VOCs	Terra Core	Water, 4 °C	48 Hours/14 Days*
	USEPA SW846 Method 8270D	TCL SVOCs+TICs	4oz glass jar	4 °C	14 Days (extraction)
	USEPA SW846 Method 8270D	CP-51 List SVOCs	4oz glass jar	4 °C	14 Days (extraction)
	USEPA SW846 Method 8082A	TCL PCBs	4oz glass jar	4 °C	14 Days (extraction)
	USEPA SW846 Method 8081B	TCL Organochlorine Pesticides	4oz glass jar	4 °C	14 Days (to extraction)
	USEPA Method 6010D	TAL Metals	4oz glass jar	4 °C	180 Days
	USEPA Method 7471B	TAL Metal - Mercury	4oz glass jar	4 °C	28 Days
	USEPA Method 7196A	Hexavalent Chromium	4oz glass jar	4 °C	30 Days
	USEPA Method 9010C	Total Cyanide	4oz glass jar	4 °C	14 Days
	Modified USEPA Method 537	PFAS	8oz HDPE Container	4 °C	14 days to Extraction, and 40 days After Extraction
	USEPA Method 8270 SIM	1,4-Dioxane	4oz glass jar	4 °C	14 Days (extraction)
	ISCO Treatment Supplier Bench Test	Soil Oxidant Demand	500 gram HPDE	4 °C	48 hours

**Table 2. Summary of Sample Parameters, Holding Times and Sample Container Requirements  
585 Union Street, Brooklyn, New York**

Sample Matrix	Test Method	Parameters	Containers	Preservation	Holding Times
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\* The holding time for VOCs in soil is 48-hours, until the sample is aliquoted and extruded into two (2) sealed vials with DI water and frozen to -7°C and one (1) sealed vial with methanol, then the holding time is extended to 14 days.

Groundwater	USEPA SW846 Method 8260C	TCL VOC+TICs	3 - 40ml VOA Vials	HCL, pH<2, 4 °C	14 days
	USEPA SW846 Method 8270D	TCL SVOCs+TICs	2 - 1000 ml glass	4 °C	7 Days (extraction)
	USEPA SW846 Method 8082A	TCL PCBs	2 - 1000 ml glass	4 °C	7 Days (extraction)
	USEPA SW846 Method 8081B	TCL Pesticides	2 - 500 ml glass	4 °C	7 Days (extraction)
	USEPA Method 6010D	Total TAL Metals	500 ml plastic	HNO <sub>3</sub> , pH<2, 4 °C	180 Days
	USEPA Method 7471B	TAL Metal - Total Mercury	500 ml plastic	HNO <sub>3</sub> , pH<2, 4 °C	28 Days
	Lab Sample Filtration	TAL Dissolved Metals	-	-	Filtration in Lab within 24 hours
	USEPA Method 3015A	Acid Digestion for Filtered TAL Metals	-	-	After Filtration
	USEPA Method 6010D	Dissolved TAL Metals	500 ml plastic	4 °C	180 Days after digestion
	USEPA Method 7471B	TAL Metal - Dissolved Mercury	500 ml plastic	4 °C	28 Days after digestion
	USEPA Method 7196A	Hexavalent Chromium	500 ml plastic	4 °C	24 Hours
	USEPA Method 9010C	Total Cyanide	250 ml plastic	NaOH, pH>12, 4 °C	14 Days

**Table 2. Summary of Sample Parameters, Holding Times and Sample Container Requirements  
585 Union Street, Brooklyn, New York**

Sample Matrix	Test Method	Parameters	Containers	Preservation	Holding Times
	Modified USEPA Method 537	PFAS	2 - 250 ml HDPE	Trizma, 4 °C	14 Days (extraction)
	USEPA Method 8270D-SIM w/Isotope Dilution	1,4-Dioxane	2 - 1000 ml glass	4 °C	7 Days (extraction)
Groundwater	USEPA Method SM5210B	Biological Oxygen Demand	500 ml plastic	4 °C	48 Hours
	USEPA Method SM5220D	Chemical Oxygen Demand	250 ml plastic	H <sub>2</sub> SO <sub>4</sub> , pH<2, '4 °C	28 Days
	USEPA Method SM4500CO2-D	Carbon Dioxide	150 ml plastic, no head space	4 °C	48 Hours
	USEPA Method 353.2 / SM 4500NO3-F	Nitrate	250 ml plastic	4 °C	48 Hours
	USEPA Method 300.0 / SM4500SO4 -E	Sulfate	250 ml plastic	4 °C	28 Days
	USEPA Method 9060A	Total Organic Carbon	Two 40 ml amber glass VOA Vials	H <sub>2</sub> SO <sub>4</sub> , pH<2, '4 °C	28 Days
	USEPA Method SM2320B	Alkalinity	250 ml plastic, no headspace	4 °C	14 Days
	USEPA Method SM2540C	Total Dissolved Solids	500 ml plastic	4 °C	7 Days

**Appendix A:**  
Key Project Personnel Resumes

## EDUCATION

### State University of New York at Plattsburg,

Bachelor of Science in Environmental Science, 1995 Applied Environmental Science Program

## EXPERIENCE

(1997-Present) – **IMPACT ENVIRONMENTAL CLOSURES Inc.**,  
*Executive Vice President, Senior Environmental Scientist*

- Principally responsible for managing environmental assessment, investigation, construction and remediation projects in commercial and industrial markets for lenders, real estate investment/development firms, construction firms and government agencies.
- Manage Phase I and II Environmental Site Assessments, State Spill Investigation and Remediation, County and Federal Underground Injection Control Programs, State & City Voluntary/Brownfield Cleanup Programs, State & Federal Superfund Sites, Brownfield Environmental Restoration Programs, Federal RCRA Closure, City E-Designation Projects.
- Responsible for environmental compliance of construction projects for waste management.
- Quality control of work products and deliverables.
- Supervise staff of geologists, hydrogeologists, engineers, environmental scientists, and environmental technicians to develop and implement sampling and analysis plans, quality assurance programs, remedial action plans.
- Provide expert witness testimony/fact statements and support in litigation cases involving soil, air and/or groundwater pollution.

(1995-1997) – **WYETH AYERST LABORATORIES**, Chemist worked in chromatographic separations division performing quality assurance analysis.

- Performed laboratory procedures and analyses in accordance with USFDA analytical test methods by liquid, gas, and thin layer chromatography.

## KEY PROJECTS

- East Side Access MTA LIRR
- Melody Cleaners
- ExxonMobil Spill- Valley Stream, NY
- Spartan Petroleum
- JFK 1020, Runway 13R-31L
- Rheingold Brewery Redevelopment Project
- WTC Greenwich Street Corridor Reconstruction
- Yankee Stadium Macomb's Park

## ORGANIZATIONS

- New York City Brownfield Partnership
- New Partners for Community Revitalization
- ASTM Committee
- National Groundwater Association
- Environmental Bankers Association
- Vapor Intrusion Network
- Long Island Geologist Association
- Environmental Consulting Professionals
- Environmental Insurance Professionals

## CERTIFICATIONS/ ACHIEVEMENTS

- Licensed Profession Geologist (NYS# 000735)
- Gold Certified Brownfield Professional 2012
- Advanced Tools for In-Situ Remediation Workshop
- ASTM Technical & Professional Training for Assessment of Vapor Intrusion into Structures of Property & New York State Department of Health, Vapor Intrusion Training
- New York Precision Equipment Global Survey Positioning Training
- MTBE & TBA Comprehensive Site Assessment and Successful Groundwater Remediation
- Environmental Data Resources, Due Diligence Workshop
- Advanced Technologies for Accelerated Natural Attenuation
- Eophysical Survey Systems, Theory and Practice of Applying Subsurface Interface Radar in Engineering and Geophysical Investigation.
- 40-Hour Occupational Safety & Health Administration

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## EDUCATION

Bachelor of Science, **Geology**, SUNY at Cortland (2012)

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## EXPERIENCE

2017-Present **IMPACT ENVIRONMENTAL** *Associate Project Manager*

- Prepares Phase I and Phase II Environmental Site Assessments (ESAs) in general conformance with ASTM Practice.
- Prepares Field Sampling Plans for NYSDEC Spill Sites.
- Carry out environmental investigative work including soil borings, soil sampling, groundwater monitoring well installation and groundwater collection, soil vapor and sub-slab soil vapor probe installation and sample collection and subsequent data analysis and presentation to client.
- Oversees logistics of small to moderate scale remediation projects, including drafting and modeling, communication with disposal facilities, subcontractors, Clients and regulatory agencies, as applicable.
- Coordinate and oversee remediation work in compliance with site-specific approved Remedial Action Work Plans and with Local, State, and Federal Regulations.

2015-2017 **VHB ENGINEERING** *Project Scientist*

- Gather field data on NYSDEC spill sites.
- Performed Underground Storage Tank removal oversight and soil screening.
- Document environmental field work, and assist in preparing and completing reports.
- Maintain community air monitoring programs and document job site activities related to foundation construction phase projects.
- Conduct groundwater (low-flow) sampling events and real time water parameter data logging using various equipment
- Contamination concentration, plume direction reports related to petroleum spills.
- Groundwater, soil & vapor sampling.
- Perform ASTM Phase I ESA Site Inspections and Prepare Reports.

## KEY PROJECTS

- Bill Wolf Petroleum
- Spartan Petroleum
- Atlantis Management Group
- Former DuPont Facility East Chicago

## CERTIFICATIONS/ ACHIEVEMENTS

- OSHA 40-hour HAZWOPER Training
- OSHA 8-hour Refresher
- OSHA 10-hour Construction Training
- OSHA 30-Hour Construction Training

# XIN YUAN, P.E.

Quality Control Manager

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## EDUCATION

**Masters of Science**, Civil Engineering, UMass Amherst (2010)

**Bachelor of Science**, Environmental Engineering. Tsinghua University, Beijing, China (2008)

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## EXPERIENCE

2010-Present **IMPACT ENVIRONMENTAL** *Quality Control Manager/Environmental Analyst*

- Quality control of all waste management/brownfield redevelopment projects;
- Management of site remediation/waste management projects;
- Environmental compliance & permitting of waste management facilities
- Achieve and maintain appropriate and consistent application of environmental compliance for waste disposal/beneficial use facilities
- Achieve and maintain appropriate and consistent application of environmental compliance at the regional Levels for waste management projects
- Review & evaluate site investigation/waste characterization results for waste management projects and provide technical recommendations to project manager
- Authored a multitude of BUD petitions for various other solid waste related projects in NY,NJ &PA, including projects such as The East Side Access, The Air Rail Project and JFK International Jet Blue Terminal 5
- Design and perform waste characterization investigations for waste management projects

## KEY PROJECTS

- Columbia University Manhattanville Development Project
- LIRR 3rd Track Expansion Project
- Atlas Quarry Reclamation Project
- Former New Jersey Zinc Company-West Plant Remediation Project
- Morris Blanchard Redevelopment Project
- Brooklyn Bridge Park Pier 1 Redevelopment Project
- Southwest Brooklyn Marine Transfer Station Redevelopment Project
- Doremus Avenue Redevelopment Project

## CERTIFICATIONS/ ACHIEVEMENTS

- Long Island Association of Professional Geologists
- American Chinese Real Estate Society

## CERTIFICATIONS/ ACHIEVEMENTS

- US EPA 40hr Hazardous Materials Response for First Responders Training
- Professional Engineer in MA, PA, NJ & NY



# DIANA POSTEN

PROJECT MANAGER

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## EDUCATION

**Bachelor of Science, Environmental Science and Management** University of Rhode Island (2008)

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## EXPERIENCE

**IMPACT ENVIRONMENTAL** - 2017-Present, *Project Manager*

- Prepares Phase I and Phase II Environmental Assessments (ESAs) in general conformation with ASTM Practice.
- Oversees logistics of small to moderate scale remediation projects, including communication with disposal facilities, subcontractors, Clients and regulatory agencies, as applicable.
- Conducts various methods of soil, soil vapor and groundwater sampling and monitoring.

**ELM GROUP, LLC** - 2014-2017, *Junior Project Manager/Environmental Specialist*

- Completed state permit forms to ensure that land use/redevelopment/site remediation project designs complied with all applicable regulations (various sites throughout NJ)
- Executed a variety of field sampling programs in accordance with NJDEP QA/QC protocols (Field Sampling Procedures Manual), and project-specific Quality Assurance Project Plans (QAPP)s which covered Remedial Action projects and Remedial Investigation projects.
- Authored technical reports; ASTM Phase I, Preliminary Assessment Reports, Remedial Investigation Reports and Remedial Action Reports

**CLOUGH HARBOUR & ASSOCIATES LLP** - 2009- 2014  
*Environmental specialist/Assistant Engineering Designer*

- Support Utility-based clients with power system and circuit design. Work included circuit voltage conversions, MAOP calculations, configuration and design of new feeders from substations, distribution improvement projects, feeder hardening, and storm restoration work during hurricane Sandy.

## KEY PROJECTS

- 3210 Park Ave NY, NY for Xenolith Partners
- 100 Charles Lindbergh Blvd Uniondale, NY for Poplar Health Care

## CERTIFICATIONS/ ACHIEVEMENTS

- NSCS National honor society chapter at University of Rhode Island
- OSHA – Health and Safety for Hazardous Waste Site Investigation Personnel Certification, 40 Hours
- OSHA – Construction Safety Course, 10 Hours
- Certification of Completion for Scientific and Technical Writing
- Certificate for Operation of Olympus Innov-X XRF X-Ray Analyzer Instrumentation
- NGA Natural Gas Distribution Systems Certification
- Rutgers’ Office of Continued Professional Education courses in; Hydrology, Geology and Chemistry, Regulatory Training on Underground Storage Tanks, Effective Environmental Field Sampling and Data Collection, and Practical Applications in Hydrology

# MANAN DALAL

ASSOCIATE PROJECT MANAGER

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## EDUCATION

Bachelor of Science, Environmental Science, Ramapo College of New Jersey (2009)

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## EXPERIENCE

**IMPACT ENVIRONMENTAL** - 2021-Present, *Associate Project Manager, Lab Manager*

- Prepares Phase I and Phase II Environmental Assessments (ESAs) in general conformation with ASTM Practice.
- Oversees logistics of small to moderate scale remediation projects, including communication with disposal facilities, subcontractors, Clients and regulatory agencies, as applicable.
- Conducts various methods of soil, soil vapor and groundwater sampling and monitoring.
- Prepare Waste Characterization reports for disposal facility approvals.
- Oversee all lab operations and upkeep all documentation for NJDEP lab certification.

**IMPACT ENVIRONMENTAL** - 2015-2021, *Project Scientist*

- Conducted various methods of soil, soil vapor, and groundwater sampling and monitoring in New York and New Jersey.
- Executed a variety of field sampling programs in accordance with NJDEP QA/QC protocols (Field Sampling Procedures Manual), and project-specific Quality Assurance Project Plans (QAPP)s which covered Remedial Action projects and Remedial Investigation projects.
- Assisted with technical reports; ASTM Phase I, Preliminary Assessment Reports, Remedial Investigation Reports and Remedial Action Reports.
- Installed several Sub-Slab Depressurization Systems for clients based on approved engineered designs.

**ALPHA EMC** - 2014- 2015, *Regional Environmental Specialist*

- Conducted daily storm water inspections for clients in the New Jersey and Pennsylvania area making sure all new residential development construction sites are in compliance with regulatory measures.
- Conduct erosion and sediment control inspections in accordance with site specific SWPPP.
- Overseeing and assisting Field Consultants in the region with questions and client relations..

## KEY PROJECTS

- 11-51 47<sup>th</sup> Avenue
- Compass Residences
- Essex Crossing
- Prospect Plaza Sites (II – IV)
- YUCO Properties
- Gerdau Ameri-Steel
- Griffin Pipe
- 207<sup>th</sup> Street Rail Yard

## CERTIFICATIONS/ ACHIEVEMENTS

- OSHA-40 Hour HAZWOPER
- OSHA-30 Hour
- OSHA-10 Hour
- State of Maryland: Erosion and Sediment Control Certification (RPC000894)
- Delaware Blue Card: Sediment and Stormwater Management (B2014/09/10)
- New York State DEC: Erosion and Sediment Control Certification (45T-122014-2)
- MTA-NYC Transit Track Safety Certification
- MTA Long Island Railroad Blue Card

**Appendix B:**  
Project QA Officer Resume

# DIANA POSTEN

PROJECT MANAGER

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## EDUCATION

**Bachelor of Science, Environmental Science and Management** University of Rhode Island (2008)

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## EXPERIENCE

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*Environmental specialist/Assistant Engineering Designer*

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**Appendix C:**  
Project Personnel Resumes

# MANAN DALAL

ASSOCIATE PROJECT MANAGER

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## EDUCATION

Bachelor of Science, Environmental Science, Ramapo College of New Jersey (2009)

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## EXPERIENCE

**IMPACT ENVIRONMENTAL** - 2021-Present, *Associate Project Manager, Lab Manager*

- Prepares Phase I and Phase II Environmental Assessments (ESAs) in general conformation with ASTM Practice.
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**IMPACT ENVIRONMENTAL** - 2015-2021, *Project Scientist*

- Conducted various methods of soil, soil vapor, and groundwater sampling and monitoring in New York and New Jersey.
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- MTA-NYC Transit Track Safety Certification
- MTA Long Island Railroad Blue Card

**Appendix D:**  
Field Operating Procedures

# **FIELD OPERATING PROCEDURES**



**TABLE OF CONTENTS**

Section                      Topic

**B.1    FIELD SAMPLING PROCEDURES..... 3**

B.1.1    Sampling Personnel ..... 3

B.1.2    Geophysical Survey ..... 3

B.1.3    Subsurface Vapor Probe and Soil Boring Installation/Soil Sampling ..... 4

B.1.4    Sample Characterization..... 4

B.1.5    Field Headspace Analysis..... 5

B.1.6    Soil Gas Survey – Photoionization Detector ..... 5

B.1.7    Soil Gas Survey –Laboratory Analysis ..... 5

B.1.8    Permanent Well Installation ..... 7

B.1.9    Well Development ..... 8

B.1.10    Monitoring Well Sampling..... 9

B.1.11    Low Flow Well Purging and Sampling..... 13

B.1.12    Grouting Bore Holes ..... 15

B.1.13    Emerging Contaminants (PFAS and 1,4-Dioxane)..... 15

B.2.1    Decontamination Procedures..... 24

B.2.2    Field Blanks ..... 24

B.2.3    Trip Blanks ..... 24

B.2.4    Duplicate Samples ..... 24

B.2.5    Matrix Spike/Matrix Spike Duplicate Samples..... 25

**B.3    RECORD KEEPING AND DOCUMENTATION PROCEDURES ..... 26**

B.3.1    Sampling Documentation ..... 26

B.3.2    Sample Containers and Analytical Requirements..... 26

B.3.3    Sample Tracking System ..... 26

B.3.4    Sample Identification System ..... 27

B.3.5    Sample Transfer ..... 28

B.3.6    Chain-of-Custody Protocol..... 28

## **B.1 FIELD SAMPLING PROCEDURES**

### **B.1.1 Sampling Personnel**

The activities associated with the remedial investigation will be performed by or under the auspices of a Quality Assurance Officer. The sample staff (samplers) will possess a minimum of a BA Degree in the Earth, Space or Biological Sciences or a BS Degree in Engineering. Samplers will have a minimum of one (1) year experience in environmental/geological fieldwork. Additionally, all samplers will have received mandatory forty-hour Occupational Safety and Health Administration (OSHA) training on working with potentially hazardous materials and appropriate Hazard Communication Program and "Right-To-Know" training.

### **B.1.2 Geophysical Survey**

A geophysical survey will be performed over target portions of the planimetric surface of the subject property utilizing a GSSI model SIR-2 ground penetrating radar (GPR) system equipped with a 400MHz antenna. The survey will be performed to identify the presence of any abandoned and/or active underground injection wells associated with the on-site sanitary systems on the Site.

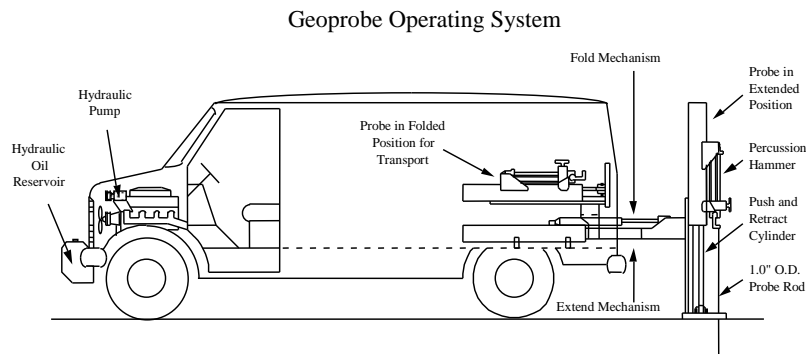
A GPR system consists of a radar control unit, control cable and a transducer (antenna). The control unit transmits a trigger pulse at a normal repetition rate of 50 KHz. The trigger pulse is sent to the transmitter electronics in the transducer via the control cable. The transmitter electronics amplify the trigger pulses into bipolar pulses that are radiated to the subsurface. The transformed pulses vary in shape and frequency according to the transducer used. In the subsurface, variations of the signal occur at boundaries where there is a dielectric contrast (void, steel, soil type, etc.). Signal reflections travel back to the control unit represented as color graphic images for interpolation. This system is capable of transmitting electromagnetic energy in the frequency range of 16MHz to 2000MHz.

A qualified Impact Environmental Consulting, Inc. technician will specify a coordinate system on the planimetric surface of the site to map any subsurface dielectric anomalies detected on the premises. The operator will use knowledge of the subsurface soil composition to calibrate the SIR-2 system to site-specific conditions. Factor settings such as range, gain, number of gain points, and scans per unit, may be modified to yield the most accurate data to describe the subsurface conditions.

Upon finding a dielectric anomaly, a more spatially specific coordinate system may be designed over the area to determine size, shape and orientation. The data collected during the survey will be reviewed by the operator and compared against past experience, technical judgment and prior site knowledge to classify any detected anomalies.

### B.1.3 Subsurface Vapor Probe and Soil Boring Installation/Soil Sampling

Subsurface probes will be installed using a *Geoprobe* hydraulically powered probing tool. Mechanized, vehicle mounted probe systems apply both static force and hydraulically powered percussion hammers for tool placement (static down forces up to 18,000 pounds combined with percussion hammers of eight horsepower continuous output). Recovery of large sample volumes will be facilitated with a probe-driven sampler. The probe-driven sampler consists of a hollow probe, which opens via a remote-control mechanism at the selected sampling depth in the soil profile to allow soil to enter as it was advanced. Discrete media samples will be secured at the desired depths and contained within a non-reactive transparent plastic sleeve that lined the hollow probe. The plastic sleeves will be removed for subsequent inspection and sample aliquot acquisition.



### B.1.4 Sample Characterization

A visual inspection of all soil samples recovered for the hydrogeological study will be conducted to classify the sample media. Color classifications will be made in accordance with the Munsell Classification System. Gradation classifications will be made in accordance with the Unified Soil Classification System.

### **B.1.5 Field Headspace Analysis**

Headspace analysis will be performed on each of the acquired soil samples utilizing a portable photo ionization detection meter to measure what, if any, hydrocarbon concentrations were present in isolated portions of the secured samples. Calibration of the PID will be conducted prior to sampling using a span gas of known concentration. Headspace analysis will be conducted by partially filling a wide-mouth glass container with sample aliquot and sealing the top with aluminum foil, thereby creating a void. This void is referred to as the sample headspace. To facilitate the detection of any hydrocarbons contained within the headspace, the container will be agitated for a period of thirty (30) seconds. The probe of the vapor analyzer will then be injected through the foil into the headspace to measure the hydrocarbon concentrations present. A Photovac Micro-Tip, photo ionization detection meter (PID) will be the organic vapor analyzer selected for the headspace analysis. A PID utilizes the principle of photo ionization for detection and measurement of hydrocarbon compounds. A PID does not respond to all compounds similarly; rather, each compound has its own response factor relative to its calibration. For this investigation, the PID will be calibrated to isobutylene. Hydrocarbon relative response factors for a PID calibrated to isobutylene are published by the manufacturer.

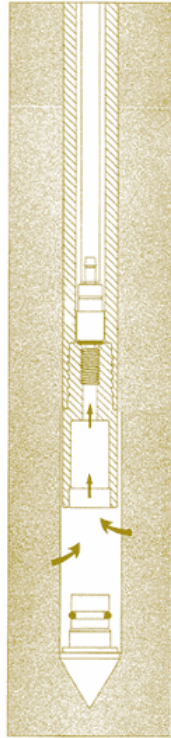
### **B.1.6 Soil Gas Survey – Photoionization Detector**

The concrete slab will be cored at the sampling points using an electric powered core drill. Subsurface probes will be installed using *Geoprobe* manual probing tools. The probes will be equipped with retractable points that allow for soil gas to be measured at discrete depths. Each soil gas sample will be collected from the retractable point utilizing 3/8-inch in diameter disposable tubing. The soil gas will be drawn (purged) for approximately 15 seconds using a portable vacuum pump. The photo ionization detector will then be attached to the tubing to secure a soil gas reading.

### **B.1.7 Soil Gas Survey –Laboratory Analysis**

Subsurface probes will be installed using a Geoprobe operating system. The probes will be equipped with a port run tubing system that allows for soil gas to be measured at discrete depths (see diagram below). This soil-gas sampling device uses a vacuum tight seal that isolates the sample acquisition to the specified depth. This device will assure quality control of the multi-depth soil-gas samples and eliminate the potential for inaccurate data. Each soil gas sample will be collected from the port run tubing system-utilizing 3/8-inch in diameter disposable Teflon tubing. The soil gas will be drawn (purged) for approximately 30 seconds using a portable vacuum pump. The soil gas will be pumped into a decontaminated portable pump and collected within a tedlar bag for preservation. Purging and sample collection flow rates will not exceed 0.2 liters per minute.

### Geoprobe Port Run Tubing System



Tracer gas field testing, using helium gas, will be performed on all implants prior to sampling, to verify the integrity of each implant seal and to limit the possibility of sample dilution from surface air. The tracer gas field test will consist of sealing the area surrounding the implant with plastic sheeting and then introduce the tracer gas underneath the sheeting, so that the area where the probe intersects the ground is immersed in the tracer gas. A Model MGD-2002 Multi-Gas Leak Locator or equivalently approved helium detector will be connected to the soil vapor implant and sub-slab vapor implant, in accordance with Section 2.7.5 of the *October 2006, Guidance for Evaluating Soil Vapor Intrusion in the State of New York* NYSDOH guidance document, and tracer gas concentrations in the well will be recorded in the sampling log sheet. This procedure will be duplicated at each implant, prior to sample collection. The laboratory will confirm the field tracer gas tests by first analyzing approximately 85 to 90% of each sample canister for VOC's via USEPA method TO-15 and then use a helium detector to analyze the remaining contents in the Summa Canisters.

The sampling logs with the recorded field tracer gas test measurements and the tracer gas measurements reported by the laboratory will be submitted to NYSDEC with the initial sampling round report. NYSDEC will review the field and laboratory tracer gas test results to determine if the bentonite/cement grout seal

for each implant will require repairs and/or replacement to reduce the infiltration of ambient air and if additional tracer gas field/laboratory testing is required in the subsequent soil vapor sampling round.

#### **B.1.8 Permanent Well Installation**

Permanent monitoring wells are installed to provide repeated access to groundwater for collecting samples, as well as for obtaining water-level and other field data. Because monitoring wells are used to collect samples, it is important that construction materials not interfere with sample quality either by contributing contaminants or by sorbing contaminants already present. Further, construction materials must be compatible with (i.e., not degraded by) contaminants present in soils or groundwater.

Monitoring wells are potential contaminant migration routes between aquifers or from the surface to the subsurface. Construction procedures and standards must ensure that neither passive nor active introduction of contaminants can occur. Properly installed hydraulic seals and locking well covers reduce the potential for cross-contamination of monitoring wells.

##### *Equipment needed:*

- Drilling or auguring equipment appropriate to site conditions, drilling depth, and other project requirements.
- Drill bits appropriate for the expected soil and rock type(s) to be encountered.
- Sufficient threaded flush-joint riser pipe of an approved material [stainless steel, polyvinyl chloride (PVC)] in convenient lengths. *(NOTE: No glues are permitted.)*
- Sufficient threaded flush-joint slotted screen of an approved material (stainless steel, PVC) to meet design criteria. *(NOTE: No glues are permitted.)*
- Properly sized and washed filter pack material (quartz sand) in sufficient volume to meet well design criteria.
- Powdered bentonite.
- Photoionization detector.
- Steel surface casing (if required).
- Steel protective casing with locking cap.
- Tremie pump and pipe.
- Protective clothing, as required.
- Weighted measuring tape.

The following steps will be followed when installing monitor wells:

1. Advance the borehole to the required depth using a bit or auger flight of a diameter sufficient to allow for insertion of the tremie pipe when the casing is centered. It is preferred that the borehole be at least 2 inches in diameter larger than the casing diameter. The borehole should be drilled slightly deeper than required for the combined length of casing and screen. The final completion depth should be sounded with a decontaminated, weighted tape before continuance of well placement.

2. Make up the screen for installation. The casing and screen must be decontaminated. Tighten joints.
3. Withdraw the drill rods and bit through the auger flights. Check the borehole depth with a weighted surveyor's tape.
4. Lower the casing string into the drill casing.
5. Install the filter pack. Six inches or more of filter pack material should be spotted at the bottom of the hole, under the screen. Filter pack will be installed to 2 - 3 feet above the top of the screen.
6. Check the depth to the top of the filter pack with a weighted tape.
7. Tremie, or for shallow wells (<35 feet), gravity feed bentonite onto the top of the filter pack.
8. Pure bentonite grout (or equivalent) will be used as the annular seal, grout will be mechanically mixed with the appropriate amount of water. For shallow wells (<35 feet) granular bentonite may be substituted for grout.
9. Tremie the grout into the annulus using a tremie. Slowly withdraw the tremie pipe as the annulus fills. Grout the well to within 1 foot of the surface. Compare actual volume of grout placed with calculated volume. Both should be annotated in the field logbook.
10. After installing grout, dismantle and clean tremie equipment.
11. Finish the concrete pad so that it slopes away from the wellhead in all directions with a minimum thickness of 4 inches. If weather conditions warrant, cover the concrete until cured. Lock the well cover.
12. If the well design specified guard posts, dig the holes and set the guard posts in concrete separate from the concrete pad. Posts and concrete must extend to a depth of 2 feet.
13. Record the appropriate construction/completion information in the field logbook and on the appropriate monitoring well installation.
14. If a form was used for the concrete pad, return to the well site after the concrete has cured for at least 24 hours and remove the form. Backfill around the pad with native soil. Drill a weep hole for protective casing and just above the concrete pad.
15. The well identification should be marked on the protective casing and PVC cap. Paint the well cover and posts, if required.

#### **B.1.9 Well Development**

Monitor wells are developed to remove fines from the filter pack. Wells should not be developed for 24 hours after completion when a bentonite grout is used to seal the annular space. However, wells may be developed before grouting if conditions warrant. Wells are purged immediately before groundwater sampling to remove stagnant water and a sample representative of groundwater conditions. Wells should be sampled within 3 hours of purging (optimum) to 24 hours after purging (maximum, for low recharge conditions).

*Equipment needed:*

- Pump, pump tubing, or bailer and rope or wire line
- Water-level meter
- Temperature, conductivity and pH meters
- Personnel protective equipment as specified in the site-specific HASP
- Decontamination supplies
- Disposal drums, if required
- Photoionization Detector

*Procedures.*

The following steps will be followed when developing wells:

1. Put on personnel protective clothing and equipment as specified in the site-specific HASP.
2. Open and check the condition of the wellhead, including the condition of the surveyed reference mark, if any. Use photoionization detector at wellhead to determine the presence of VOCs (if applicable).
3. Determine the depth to static water level and depth to bottom of the casing.
4. Prepare the necessary equipment for developing the well. There are a number of techniques that can be used to develop a well. Some of the more common methods are bailing, surging and purge, and over pumping.
5. Continue well development until produced water is clear and free of suspended solids.
6. Remove the pump assembly or bailers from the well, decontaminate, and cleanup the site.
7. Lock the well cover before leaving. Dispose of produced water as required by the project work plan.

**B.1.10 Monitoring Well Sampling**

Monitoring well sampling is conducted with the goal of collecting data representative of groundwater conditions in the subsurface. The data obtained from a sampling event is typically very important for decision making, as it may be used to identify the presence of constituents of concern in groundwater, monitor the performance of a remedial measure, or evaluate the risks to potential receptors.

A written site specific monitoring or sampling plan is typically available that identifies the frequency of sampling, the wells to be monitored, equipment to be used, required laboratory analytical methods and parameters, sampling procedures, equipment decontamination procedures, sample quality



assurance/quality control (QA/QC) measures and data reporting requirements. Each monitoring or sampling plan will vary from one site to the next and should be reviewed when planning for a monitoring well sampling event.

#### *Equipment:*

The following is a list of standard equipment needed to conduct monitoring well sampling. Additional equipment may be required based on the sampling techniques and site conditions.

- Health and Safety Plan (HASP)
- Field Book
- Personal Protective Equipment
- Decontamination Equipment
- Traffic Control Devices
- Polyethylene Sheeting
- Bailers
- String
- Pumps
- Power Source to Operate Pumps
- Water Level Meter
- Tubing
- Buckets
- Sample Bottles
- Cooler
- Ice
- Bubble Wrap
- Calculator
- Disposable gloves

#### *Procedures*

##### Monitoring Well Gauging

Monitoring wells are typically gauged before sampling. Gauging includes measuring the depth to water (and/or non-aqueous phase liquids) and depth to bottom in the monitoring well with an electronic water level meter (WLM) or electronic interface probe (EIP). An EIP is used to gauge a well that contains non-aqueous phase liquids (NAPL-floating product). If wells do not contain NAPL, then a WLM is sufficient. The list of monitoring wells to be gauged should be provided in the monitoring or sampling plan and listed on the PTA. The entire network of monitoring wells should be gauged before sampling begins.

##### *Sample Bottles*

Groundwater samples are collected into laboratory supplied bottles. Bottles are typically ordered from the laboratory in advance of the sampling event. The size, bottle material (glass, plastic), and number of

bottles required for each sample will depend on the constituents being analyzed for and the analytical methods. Bottles delivered from the laboratory may contain a small amount of preservative. The preservative is to remain in the bottle. Overfilling the bottle may result in dilution of the preservative and should be avoided. When sampling for volatile compounds, no air (bubbles) may be present in the sample bottle.

### *Sampling Techniques*

Many different techniques exist for sampling monitoring wells. The techniques vary depending on the constituents of concern, depth to groundwater, diameter of monitoring well and regulatory requirements. The technique appropriate for a specific site should be identified in the monitoring and sampling plan

### *Purging*

Many of the sampling techniques include purging the monitoring well prior to sample collection. Purging is intended to remove stagnant water from the monitoring well after which a representative sample of the groundwater from the subsurface can be collected. During purging, three to five volumes of standing water in the well are removed. The volume of water in a monitoring can be calculated using the following equation:

$$\text{Feet of standing water in well} * \text{Conversion factor} = 1 \text{ well volume}$$

Example:

$$10' * 0.65 = 6.5 \text{ gallons (1 well volume)}$$

Well Diameter (in inches) Conversion Factor

½ 0.01

1 0.04

2 0.16

3 0.37

4 0.65

6 1.50

Purge water must be managed in accordance with the monitoring or sampling plan and local regulations.

### *Field Monitoring*

Monitor indicator parameters (main indicator parameter for VOCs is DO) during purging, monitor and record the field indicator parameters (turbidity, temperature, specific conductance, pH, Eh and DO) at three to five-minute intervals. The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive readings as follows:

1. 50 NTUs for turbidity

+/-0.1 for pH

2. +/-3% for conductance
3. +/-10 mv for redox potential
4. +/-10% for DO and turbidity

#### *Sample Chain of Custody*

The chain of custody (COC) form is used to record the inventory of samples to be delivered to the laboratory and document the transfer of custody from the sampler to the laboratory. All samples, including QA/QC samples, to be delivered to the laboratory must be listed on the COC along with requested analytical methods and parameters. The COC is to remain with the samples from the time of collection until receipt at the laboratory.

Sample Handling, Storage and Shipment Samples should be stored in laboratory-supplied coolers immediately after sampling. The cooler must contain ice in order to bring the temperature of the sample to 4 degrees Celsius. Samples must remain on ice until received by the laboratory. Care must be exercised to ensure that bottles do not break during handling of the cooler. Glass-on-glass contact often leads to breakage and should be avoided by wrapping each bottle in bubble wrap material.

Samples are to be delivered to the laboratory in coolers as soon as possible after collection. Each laboratory analytical method has a unique holding time, which is defined as the maximum time between sample collection and analysis by the laboratory. Samples analyzed after the hold time are usually considered invalid. Hold times may vary from one day to 6 months depending on the laboratory analytical methods. Holding time information can be obtained from the laboratory. It is the responsibility of the sampler to confirm that the delivery method will ensure receipt of the samples by the laboratory within the allotted holding time.

Sample delivery options include: shipment by common courier, personal delivery to the laboratory and delivery by the laboratory's courier service. Each laboratory may have a preferred sample delivery process. Coolers must be packed with sufficient amounts of ice and bubble wrap material to ensure the samples will be received by the laboratory intact and at an acceptable temperature. A custody seal, provided by the laboratory, should be placed over the opening between the lid and the base of the cooler, and the seal ID number recorded on the chain of custody form. The custody seal provides a means of alerting the laboratory if the cooler has been opened, and potentially tampered with, between the time it was sealed by the sampler and received by the laboratory. Guidance on cooler packing may be obtained from the laboratory.

### *Decontamination*

Decontamination is necessary to avoid cross-contaminating samples. Sampling equipment that is not dedicated to a specific well must be decontaminated before sampling and after each sample is collected. Decontamination procedures may be specific to the site's monitoring or sampling plan. Typical equipment decontamination procedures may include rinses in the following sequence:

- 1) Tap water rinse
- 2) Alconox rinse
- 3) Tap Water Rinse
- 4) Deionized water rinse

When possible, samples should be collected from the least contaminated wells first and progress onto the more contaminated wells in order to reduce chances of sample cross-contamination.

### Documenting a Monitoring Well Sampling Event

Information from the monitoring well sampling event must be documented on a field data form or recorded in the site-specific field book. Information to be recorded includes weather conditions, well integrity issues, well gauging information, purge volumes, sampling equipment and supplies used, sample identifications, sample collection times and the presence of any conditions that may compromise the integrity of the samples.

## **B.1.11 Low Flow Well Purging and Sampling**

### *Purpose*

The purpose of the low flow (low formation stress) purging and sampling procedure is to collect groundwater samples from monitoring wells that are representative of ground water conditions in a particular geological formation. This is accomplished by setting the intake velocity of the sampling pump to a flow rate, which limits drawdown inside the well casing. The placement of the intake of the sampling pump should be midway within the most permeable zone of the formation.

### *Equipment*

- Pump system (adjustable rate, positive displacement groundwater sampling pump e.g., bladder or centrifugal pump)
- Control box (with or without a built-in compressor)
- Compressed Nitrogen tank (if necessary)
- Indicator parameter monitoring device(s)

- Flow measurement device (Flow cell)
- Personal Protection Equipment (PPE)
- Field Book
- Health and Safety Plan (HASP)
- Tools to access monitoring wells
- Disposable gloves
- Kevlar gloves
- Safety cones
- Sample containers (provided by laboratory)
- Chains of Custody (provided by laboratory)
- Blank or Pre-printed labels
- Glassware with appropriate preservative (provided by the laboratory)
- Ice
- Calculator
- Adsorbent pads
- Electronic interface probe
- Decontamination equipment
- String
- Appropriate size bailers
- Tubing (preferably Teflon for organics)

*Procedure*

Remove the gripper cap at all well locations and allow the water table to equilibrate, take care to secure all wells by closing the flush mount covers. Start sampling at the well-known or believed to have the least contamination and systematically to the most contaminated well, remembering to conduct proper decon procedure. During gauging and sampling activities equipment should not come into direct contact with the ground surface, plastic sheeting may be utilized as a clean and disposable working surface.

Slowly lower the pump to the depth specified for that well, the pump intake should never be set within two feet of the bottom of any well. This prevents disturbance and resuspension of any sediment. Record the depth of the pump intake. Re-measure the water level and begin purging, keeping the purge rate within 200-500 millimeters per minute (ml/min). Water level should be measured and recorded at three to five-minute intervals. Ideally, a steady flow rate should be maintained that results in a stabilized water level (drawdown of 0.3 ft or less is desired). Monitor indicator parameters (main indicator parameter for VOCs is DO) during purging, monitor and record the field indicator parameters (turbidity, temperature,

specific conductance, pH, Eh and DO) at three to five-minute intervals. The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive readings as follows:

1. 50 NTUs for turbidity
2. +/-0.1 for pH
3. +/-3% for conductance
4. +/-10 mv for redox potential
5. +/-10% for DO

Collect sample from dedicated or disposable tubing. Remove any non-dedicated equipment from the well. Secure all wells. Fill out the chain of custody. At the end of the sampling day, coolers will be taped shut with the custodian's initials placed on custody seals at points of entry. Samples will be shipped via lab courier to the contract laboratory for morning delivery, picked up by courier or delivered directly to the laboratory by the field personnel at the end of the sampling day.

Contact with the laboratory will be made within 24 hours after each sampling event to ensure that samples arrived safely and with proper integrity preserved.

#### **B.1.12 Grouting Bore Holes**

Subsequent to the completion of each soil and groundwater probe installed during the remedial investigation, bottom-up grouting of the borehole will be conducted to grade. The grouting system was designed specifically for direct push applications. With powerful reciprocating (piston) pumps, the Geoprobe Grout Machines will deliver standard ASTM grout materials through 1.25-inch diameter Geoprobe probe rods or through 3/8-inch (1/4-inch inside diameter) polyethylene tubing. The pump is rated at 1000 psi with flow rates from 0.9 to 2.3 gpm.

#### **B.1.13 Emerging Contaminant PFAS**

The NYSDEC requires analysis for Per- and Polyfluoroalkyl Substances (PFAS) for new remedial program Sites as part of the investigation of potentially affected media, including soil, groundwater, surface water and sediment as an addition to the standard TAL/TCL sampling. Soil vapor sampling for PFAS is not required.

The following is the list of the 21 PFAS compounds identified by the NYSDEC for investigation:

- Perfluorobutanoic Acid
- Perfluoropentanoic acid
- Perfluorohexanoic acid
- Perfluoroheptanoic acid
- Perfluorooctanoic acid (PFOA)
- Perfluorononanoic acid
- Perfluorodecanoic acid
- Perfluoroundecanoic acid
- Perfluorododecanoic acid
- Perfluoro-n-tridecanoic acid
- Perfluorotetradecanoic acid
- Perfluorobutane sulfonic acid
- Perfluorohexane sulfonic acid
- Perfluoroheptane sulfonic acid
- Perfluorooctane sulfonic acid (PFOS)
- Perfluorodecane sulfonic acid
- 6:2 Fluorotelomersulfonic acid
- 8:2 Fluorotelomersulfonic acid
- Perfluorooctanesulfonamide
- N-methyl perfluoro-1-octanesulfonamidoacetic acid
- N-ethyl perfluoro-1-octanesulfonamidoacetic acid

#### **PFAS Sampling Protocol:**

Since the probability of false positives is relatively high during PFAS sample collection, due to the potential for many sources of cross-contamination combined with the low laboratory detection limits, guidance is needed for staff who will perform subsurface investigation activities (i.e., soil borings, monitoring well installation) and for staff collecting and/or handling PFAS environmental samples.

There are many products/materials/supplies that contain PFAS which pose a greater risk for introducing PFAS contamination into a sample during the sample collection process. These sources include the water used during drilling or decontamination, materials used within the sampling environment, sampling equipment, field clothing and personal protective equipment, sun and biological protection products, personal hygiene and personal care products, food packaging and the environment itself.

#### **Field Clothing and Personal Protective Equipment (PPE)**

Due to the extensive use of PFAS in many industries and products, clothing and PPE are likely to contain PFAS. Personnel completing field investigation work that will include the collection of samples for PFAS

analysis will need to address the physical, chemical and biological hazards associated with the Site. Field planning is essential to mitigate the potential for PFAS cross-contamination and to maintain personal safety.

- No clothing or boots with protective coatings can be worn (e.g., waterproof, water-repellent, fire-repellant or stain-resistant clothing or footwear). No Gore-Tex® or Tyvek material clothing/boots.
- Clothing worn during the collection of samples for PFAS analysis should be made of natural fibers (preferable cotton) and must have been previously washed a minimum of 5 times (i.e. no new clothing), without fabric softener and not with other clothing that may contain coatings.
- Use disposable, coating-free polyethylene coveralls and boot as applicable.
- Do not use personal care products on the day of sample collection:
  - Use PFAS-free soap and shampoo when scheduled for sample collection.
  - Limit toothpaste, mouthwash and dental floss to fluoride free options.
  - Do not use lotions, moisturizers, cosmetics, sunscreen or insect repellents prior to sampling.
- Use disposable, nitrile gloves.
- Do not use aluminum foil, prepackaged food, fast food wrappers or containers.

#### Field Sampling Equipment/Materials:

Because of the potential presence of PFAS in equipment typically used for drilling and to collect soil, groundwater, surface water, sediment, and drinking water samples, as well as the need for very low reporting limits, special handling and care must be taken when collecting samples for PFAS analysis to avoid sample contamination. The following guidance should be considered when using field sampling equipment.

- A screening of the equipment and materials that will be used during field sampling activities must be completed to identify equipment/materials that may be potential PFAS sources.
- Identify and use a PFAS free water source for drilling and decontamination of equipment.
- Use high density polyethylene [HDPE] water holding tanks.
- Use HDPE or silicone tubing materials.
- Use HDPE or polypropylene containers with HDPE or polypropylene caps.
- Use regular ice and Ziploc bags where there is no direct contact with the sample.
- Use loose plain paper, metal clipboard, ballpoint pens.
- When feasible, utilize single-use, disposable polyethylene or silicone materials (tubing, bailers, etc.) for monitoring well purging and sampling.



- Consumable core liners and catchers must be PVC.
- When using positive displacement/submersible pumps, familiarize yourself with the sampling pump/accessory equipment specifications to confirm that the device components do not contain Teflon® or Polytetrafluoroethylene (PTFE). Do not use pumps and tubing that contain Teflon™ and other fluoropolymer-containing materials.
- Do not use waterproof/treated paper or field books, plastic clipboards, water proof markers, Post-its and other adhesive paper products.
- Do not use passive diffusion bags for groundwater sampling.
- Do not use low density polyethylene (LDPE) sampling equipment/materials.
- Do not use drill casing thread lubricants that contain PFAS. Verify with supplier.
- Do not use LDPE or glass bottles with Teflon™-lined caps.
- Do not use chemical ice packs (i.e., Blue ice®).
- Do not handle any packaged food or drinks, aluminum foil, adhesive labels, etc. at or around sampling site.

#### Equipment Prep and Decontamination Procedures

The following procedure should be used to decontaminate HPDE, polypropylene or stainless-steel equipment used to collect samples for PFAS analysis. Because of the extremely low detection and reporting levels required for PFAS analysis, precaution should be taken to ensure decontamination materials (e.g., soap, tap water, deionized water) are not contaminated with PFAS prior to use. Traditional best practice techniques and procedures shall be subject to modification to prevent the introduction of non-site-derived contaminants including PFAS. Sample containers will be new and used only once for each sample and disposable equipment (e.g., gloves, tubing, etc.) will not be reused, therefore; these items will not require decontamination. All non-dedicated or non-disposable sampling equipment (i.e., the stainless-steel compositing vessel(s), flow-through cell, etc.) will be decontaminated between sample locations. The following guidance should be considered when preparing equipment and decontamination of equipment.

- An equipment decontamination area with a decon pad should be set up in the field to accommodate the sampling and drilling equipment.
- General Sampling Equipment Decon:
  - Rinse equipment with PFAS free – municipal PFAS free water to remove solids.
  - Use a polyethylene or poly vinyl chloride (PVC) brush and a low-phosphate lab detergent (i.e., Alconox) to scrub the equipment to remove residue and particulates.
  - Triple rinse clean equipment with PFAS Free deionized water and let air dry.

- Decontaminate sampling equipment after sampling at each location, or at the end of the field work day.
- The decontamination water should be changed between equipment cleanings.
- Clean, decontaminated equipment will be placed on clean polyethylene plastic or HPDE sheets to air dry. Direct contact with the ground will be avoided.
- Drilling Equipment Decon:
  - Drilling equipment, including rig, tooling, augers, bits, samplers, tremie pipes, etc. will be cleaned with a hot water pressure washer within a decon pad constructed of on clean polyethylene plastic or HPDE sheets and barriers to contain liquid generated.
  - The clean drilling equipment will be rinsed with PFAS Free deionized water and let air dry on clean polyethylene plastic or HPDE sheets.
  - Drilling equipment must be cleaned before beginning work (when applicable), in-between/following completion of borings, wells, and at the end of the field work day.
  - Tools, drill rods, and augers will be placed on polyethylene plastic or HPDE sheets following pressure washing. Direct contact with the ground will be avoided.
  - Decon water will be temporarily collected in 55-gallon drums and transported to a waste accumulation area for later disposal.
- Well Development Equipment Decon:
  - Prior to well development, non-dedicated equipment (e.g., bailers, PFOS-free pumps, etc.) will be washed with potable water and a PFC/phosphate-free detergent (i.e., Alconox®).
  - The sampling equipment will then be rinsed with potable water followed by a triple rinse with PFAS Free deionized water.
  - The clean/decontaminated equipment will be placed on polyethylene plastic or HPDE sheets to air dry. At no time, will washed equipment be placed directly on the ground.
  - Decon water will be temporarily collected in 55-gallon drums and transported to a waste accumulation area for later disposal.

### Sample Collection

PFAS are ubiquitous in consumer products and the pervasive presence of these chemicals coupled with very sensitive analytical methods makes contamination of samples both in the lab and the field a significant concern from sources extraneous of the environmental media being sampled. The following guidance should be considered when undertaking collection of samples for PFAS analysis.

- Transport of sample collection supplies and equipment have the potential to come into contact with carpets and fabric in vehicles which have likely been treated with stain-resistant/water proofing containing PFAS. Steps should be taken to minimize this contact by packaging supplies

and equipment in the designated coolers and/or using polyethylene plastic or HPDE sheets as a barrier.

- Sample container labels should be prepared to the extent possible using a ball-point pen only before arrival at the sampling site and completed at the Site with a ball point pen; do not use sharpie or other permanent markers. No waterproof logbooks or plastic clipboards are to be used.
- Keep materials/equipment that may contain PFAS away from the sampling area and avoid physical contact with anything likely to contain PFAS (e.g., food, clothing, personal care products, etc.) during the sample collection process.
- Maintain an inventory of items used/maintained in the sampling area.
- If other sampling is to be performed, ALWAYS collect PFAS samples first. This avoids contact with any other type of sample container, bottles or package materials
- All sample containers use for PFAS sampling must come from the laboratory that will also be performing the PFAS analysis. Recommended sampling containers should be HDPE bottles fitted with unlined (no Teflon) polyethylene screw caps.
- Sample containers must be stored in a PFAS free container prior to sampling.
- For all environmental media, hands should be washed well before sampling.
- Wear disposable, powder free nitrile gloves to handle sampling equipment and sample containers. Clean nitrile gloves should be used when collecting the sample.
- Take precautions not to touch any surfaces prior to sample collection.
- As with all other samples, do not place the sample bottle cap on any surface when collecting the sample, and avoid all contact with the inside of the sample bottle or its cap.
- Sample directly into the provided HDPE bottle seal with cap. Place the bottles into individual sealed plastic bag (e.g. Ziploc®) separate from other samples in a clean, dedicated cooler for PFAS samples only.
- Use bagged ice (PFAS free) in the dedicated PFAS sample cooler; NO chemical ice packs in this cooler.
- No samples collected for other parameters can be stored with the PFAS samples.

#### *PFAS Analysis and Reporting*

The designated analytical laboratory must provide a full category B deliverable, and a DUSR will be prepared by an independent 3<sup>rd</sup> party data validator. QA/QC samples will be collected as required in DER-10, Section 2.3(c).

Modified EPA Method 537 is the preferred method to use for environmental samples due to its ability to achieve very low detection limits. Reporting limits for PFAS in groundwater and soil are to be 2 ng/L (ppt) and 1 ug/kg (ppb), respectively. If contract labs or work plans submitted by responsible parties indicate that they are not able to achieve these reporting limits for the entire list of 21 PFAS, site specific decisions will need to be made by the NYSDEC project manager in consultation with the NYSDEC remedial program chemist. Note: Reporting limits for PFOA and PFOS in groundwater should not exceed 2 ng/L.

The NYSDEC has developed a PFAS Analyte List for remedial programs. If lab and/or matrix specific issues are encountered for any compounds, the NYSDEC PM, in consul with the NYSDEC Remedial Program Chemist, will make case-by-case decisions as to whether certain analytes may be temporarily or permanently discontinued from analysis at each Site.

### Summary of Prohibited and Acceptable Items for PFAS Sampling

Prohibited	Acceptable
<b>Field Equipment</b>	
Teflon/Silicone containing materials	HDPE, stainless steel, polypropylene materials
LDPE materials	Acetate liners
Waterproof field books/paper/bottle labels	Loose non-waterproof paper, and non-waterproof sample labels
Plastic Clipboards/binders/hard cover notebooks	Aluminum field clipboards or with Masonite
Waterproof markers/sharpiers	Pens
Post-it-notes	Wet-ice
Chemical ice packs	
<b>Field clothing and PPE</b>	
New cotton clothing or synthetic water resistant, waterproof, or stain-treated clothing, clothing treated with Gore-Tex	Well laundered clothing made of natural fibers (preferably cotton)
Clothing laundered with fabric softener	No fabric softener
Boots containing Gore-Tex or treated with water resistant spray	Boots made with polyurethane and PVC
Tyvek	Laundered cotton clothing
Cosmetics, moisturizers, hand cream etc. as part of personal cleaning/showering routine, or non-natural toxic containing sunscreens and insecticides	Natural, non-toxic, and natural sunscreens/insect repellents.
<b>Sample Containers</b>	
LDPE or glass containers	HDPE or polypropylene
Teflon-lined caps	Unlined polypropylene caps
<b>Rain events</b>	
Waterproof or resistant rain gear	Wet weather gear made from polyurethane and PVC only
<b>Equipment Decontamination</b>	
Decon 90	Alconox
Liquinox	7 <sup>th</sup> Generation Free & Clear Dish Soap
Water from onsite well	
<b>Food considerations</b>	
All food and drink with the exceptions of those noted on the right	Bottled water with hydration fluids (i.e. Gatorade and Powerade) to be brought and consumed only in staging areas
<b>Vehicle Considerations</b>	
Vehicle fabrics, carpets and mats may contain PFAAs	Avoid utilizing areas inside vehicles as sample/staging areas

#### **B.1.14 Emerging Contaminant 1,4-Dioxane**

The NYSDEC requires analysis for 1,4-Dioxane for new remedial program Sites as part of the investigation of potentially affected media, including soil, groundwater, surface water and sediment as an addition to the standard TAL/TCL sampling. Soil vapor sampling for 1,4-Dioxane is not required. 1,4-Dioxane is used as a stabilizer and inhibitor in chlorinated solvents, and used for a wide variety of other industrial processes. It is present in adhesives, sealants, cosmetics, pharmaceuticals, rubber chemicals and surface coatings.

The NYSDEC reporting limit for 1,4-dioxane in groundwater should be no higher than 0.35 µg/L (ppb) and no higher than 0.1 mg/kg (ppm) in soil. Materials used in environmental sampling can be a source of 1,4-dioxane contamination. 1,4-Dioxane also might be present in detergents used to decontaminate environmental sampling equipment.

Because of the potential presence of 1,4-dioxane in equipment typically used to collect environmental samples, as well as the need for very low reporting limits, special handling and care must be taken when collecting samples to avoid sample contamination. The best practice techniques and procedures provided in Section B.1.13 entitled *Emerging Contaminant PFAS* should be implemented when collecting samples for 1,4-dioxane analysis.

Although ELAP offers certification for both EPA Method 8260 SIM and EPA Method 8270 SIM in waters, the NYSDEC DER is advising the use of Method 8270 SIM because it provides a more robust extraction procedure, uses a larger sample volume, and is less vulnerable to interference from chlorinated solvents. The analysis currently performed for SVOCs in soil is adequate for evaluation of 1,4-dioxane in soil, which already has an established SCO.

## **B.2 QA/QC FIELD PROCEDURES**

### **B.2.1 Decontamination Procedures**

Prior to arrival on the Site and between sample locations, the probes will be decontaminated by steam cleaning, Alconox wash, and rinsing with distilled water. This will be followed by air drying as per project requirements. All sampling apparatus will be dedicated or disposable. A clean, new liner will be used for each sample. Parts will be inspected for wear and damage before each use.

### **B.2.2 Field Blanks**

A field blank is a sample of analyte-free water transferred, at the project site, into an appropriate container for the purpose of distinguishing ambient air contamination from in-situ sample contamination. Field blanks are used to indicate potential cross contamination from sampling equipment as quality control of decontamination procedures. With regards to field sampling, one field blank will be collected for every work day. The procedures for obtaining a field blank sample are as follows:

- Collect two sets of sample vessels. One vessel shall contain analyte free water and the other is empty.
- Run the analyte free water through the decontaminated sampling equipment into the empty vessel. Analyze the water of this collecting vessel for target analytes.

### **B.2.3 Trip Blanks**

A trip blank is used to identify the presence of volatile compound contamination attributable to transfer across a sample container septum during shipping and storage of samples. A trip blank is a sample of analyte-free matrix that is transported from the laboratory to the sampling site with the sample containers. The trip blank is stored on-site with the sample containers and field samples and then transported back to the laboratory with the samples for analysis. The trip blank is received and processed as a sample by the laboratory. One trip blank shall be submitted per pickup from laboratory personnel.

### **B.2.4 Duplicate Samples**

Duplicate sample collection will apply to groundwater, soil, soil vapor and ambient air samples collected at this Site. A duplicate (replicate) sample is collected to control the general sampling methodology that is being employed. This sample ensures that a representative sample is being collected. Duplicate samples may also be submitted to verify the accuracy of analytical results.

### **B.2.5 Matrix Spike/Matrix Spike Duplicate Samples**

Matrix Spike/Matrix Spike Duplicate sample collection will apply to groundwater samples collected at this Site. A Matrix Spike and Spike Duplicate (MS/MSD) sample(s) are representative but randomly chosen client samples that have known concentrations of analytes of interest added to the samples prior to sample preparation and analysis. They are processed along with the same un-spiked sample. The purpose of the MS/MSD is to document the accuracy and precision of the method for that specific sample.



## **B.3 RECORD KEEPING AND DOCUMENTATION PROCEDURES**

### **B.3.1 Sampling Documentation**

The sample team or individual performing an activity shall be required to keep a weatherproof Site field notebook. The Site field notebook will be used on-site to record notes pertaining to the field sampling plan. Field notebooks are intended to provide sufficient data and observations to enable participants to reconstruct events that occurred during projects and to refresh the memory of the field personnel if called upon to give testimony during legal proceedings. In a legal proceeding, notes, if referred to, are subject to cross-examination and are admissible as evidence. The field notebook entries should be factual, detailed, and objective. All entries are to be signed and dated. All members of the field investigation team are to use this notebook, which shall be kept as a permanent record. The field notebook shall be filled out at the location of sample collection immediately after sampling. It shall contain sample descriptions including: sample number, sample collection time, sample location, sample description, sampling method used, daily weather conditions, field measurements, name of sampler, and other site-specific observations. The field notebook shall contain any deviations from the protocol contained herein, visitor's names, and community contacts made during sampling, and geologic and other site-specific information that may be noteworthy.

### **B.3.2 Sample Containers and Analytical Requirements**

All sample vessels will be "level A" certified decontaminated containers supplied by a New York State Certified Commercial Laboratory. Samples analyzed for hydrocarbons will be placed in containers with Teflon lined caps. All samples will be preserved by cooling them to a temperature of approximately four degrees Celsius. If glass bottles are used, extra glass bottles will be obtained from the laboratory to allow for accidental breakage that may occur. Necessary preservatives will be placed in the sample bottles by the laboratory. The sample bottles will be handled carefully so that preservatives and glassware are not inadvertently spilled. All liquid samples will be put into 40-ml glass vials with Teflon liners.

### **B.3.3 Sample Tracking System**

In order to provide for proper identification in the field, and proper tracking in the laboratory, all samples must be labeled clear and in a consistent fashion using the procedures and protocols described below and with the following subsections.

Sample labels will be waterproof and have a pre-assigned, unique number that is indelible.

Field personnel must maintain a field notebook. This notebook must be water resistant with sequentially numbered pages. Field activities shall be sequentially recorded at a later time. The notebook, along with the chain of custody form, must contain sufficient information to allow reconstruction of the sample collection and handling procedure at a later time. Each sample shall have a corresponding notebook entry that includes:

- Sample ID number
- Well location and number
- Date and time
- Analysis for which sample was collected
- Additional comments as necessary
- Sampler's name

Each sample must have a corresponding notebook entry on a chain-of-custody form. The manifest entry for sampling at any one location is to be completed before sampling is initiated by the same sampling team at any other location. In cases where the samples leave the immediate control of the sampling team, the samples must be sealed.

#### **B.3.4 Sample Identification System**

Each sample collected shall be designated by an alphanumeric code that shall identify the type of sampling location, the specific location, the matrix sampled, and a specific sample designation. Site specific procedures are described below.

Sample identifications shall contain a sequential code consisting of three segments. The first segment shall designate the project number. The second segment shall identify the location type. Location types shall be identified by a two-letter code. For example, MW will be used for monitoring well and GP for geoprobe. The third segment shall identify the specific sample location. The specific sampling location shall be identified using a three-digit number.

The fourth segment shall identify the matrix type and sample designation or identifier that identifies the sample depth, the sample event number, or other designation depending on the sample type. The matrix type shall be designated by a two-letter code. For example: GW will be used for groundwater. The sample identifier shall be represented by a two digit numeric code. Sampling events or rounds, such as for groundwater sampling shall be numbered in sequence beginning with "01" that corresponds to the round of sampling.

The following shall be a general guide for sample identification:

<b>First Segment</b>	<b>Second Segment</b>	<b>Third Segment</b>	<b>Fourth Segment</b>
NNN	AA	NNN	AANN
Project #	Location Type	Specific Type	Matrix Sample Identifier
455	GP	1	GW01

Symbol Definitions:

A = Alphabetic

N = Numeric

Location Type:

MW = Monitoring Well

GP = Geoprobe

Matrix Type:

S = Soil

GW = Groundwater

### **B.3.5 Sample Transfer**

Samples shall be containerized and immediately transferred within a cooler to the mobile laboratory with minimal disturbance. Chain-of-custody forms will be completed at the time of sample collection and will accompany the samples inside a cooler for transfer from sample team to mobile laboratory representatives.

### **B.3.6 Chain-of-Custody Protocol**

The primary objective of the sample custody procedures is to create an accurate written record that can be used to trace the possession and handling of all samples from the moment of their collection, through analysis, until their final disposition. Sample custody for samples collected during the investigation will be maintained by the field personnel collecting the samples. Field personnel are responsible for documenting each sample transfer and maintaining custody of all samples until they are transferred to the mobile laboratory.

**Appendix E:**  
Alpha Analytical Parameters  
Summary Tables



1,4 Dioxane via EPA 8270D-SIM (SOIL)

Holding Time: 14 days  
 Container/Sample Preservation: 1 - Glass 250ml/8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria
1,4-Dioxane	123-91-1	8	2.04	ug/kg	40-140	30	40-140	30	30	
1,4-Dioxane-d8	17647-74-4									15-110
1,4-Dioxane-d8 (IS)	17647-74-4			ug/kg						

*Please Note that the RL information provided in this table is calculated using a 100% Solids factor. (Soil/Solids only)  
 Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, Inc.*

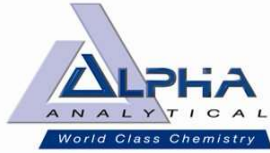


METALS by 6010D (SOIL)

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria	Holding Time	Container/Sample Preservation
Aluminum, Total	7429-90-5	4	1.08	mg/kg	48-151		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Antimony, Total	7440-36-0	2	0.152	mg/kg	1-208		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Arsenic, Total	7440-38-2	0.4	0.0832	mg/kg	79-121		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Barium, Total	7440-39-3	0.4	0.0696	mg/kg	83-117		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Beryllium, Total	7440-41-7	0.2	0.0132	mg/kg	83-117		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Cadmium, Total	7440-43-9	0.4	0.0392	mg/kg	83-117		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Calcium, Total	7440-70-2	4	1.4	mg/kg	81-119		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Chromium, Total	7440-47-3	0.4	0.0384	mg/kg	80-120		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Cobalt, Total	7440-48-4	0.8	0.0664	mg/kg	84-115		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Copper, Total	7440-50-8	0.4	0.1032	mg/kg	81-118		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Iron, Total	7439-89-6	2	0.3612	mg/kg	45-155		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Lead, Total	7439-92-1	2	0.1072	mg/kg	81-117		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Magnesium, Total	7439-95-4	4	0.616	mg/kg	76-124		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Manganese, Total	7439-96-5	0.4	0.0636	mg/kg	81-117		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Nickel, Total	7440-02-0	1	0.0968	mg/kg	83-117		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Potassium, Total	7440-09-7	100	5.76	mg/kg	71-129		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Selenium, Total	7782-49-2	0.8	0.1032	mg/kg	78-122		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Silver, Total	7440-22-4	0.4	0.1132	mg/kg	75-124		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Sodium, Total	7440-23-5	80	1.26	mg/kg	72-127		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Thallium, Total	7440-28-0	0.8	0.126	mg/kg	80-120		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Vanadium, Total	7440-62-2	0.4	0.0812	mg/kg	78-122		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Zinc, Total	7440-66-6	2	0.1172	mg/kg	82-118		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved

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 File: PM6660-1  
 Page: 1

METALS by 7471B (SOIL)

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria	Holding Time	Container/Sample Preservation
Mercury, Total	7439-97-6	0.08	0.016896	mg/kg	72-128		80-120	20	20		28 days	1 - Metals Only-Glass 60mL/2oz unreserved

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TCL Pesticides - EPA 8081B (SOIL)

Holding Time: 14 days  
Container/Sample Preservation: 1 - Glass 250ml/8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Delta-BHC	319-86-8	0.0016008	0.00031349	mg/kg	30-150	30	30-150	50	50			
Lindane	58-89-9	0.000667	0.000298149	mg/kg	30-150	30	30-150	50	50			
Alpha-BHC	319-84-6	0.000667	0.000189428	mg/kg	30-150	30	30-150	50	50			
Beta-BHC	319-85-7	0.0016008	0.00060697	mg/kg	30-150	30	30-150	50	50			
Heptachlor	76-44-8	0.0008004	0.000358846	mg/kg	30-150	30	30-150	50	50			
Aldrin	309-00-2	0.0016008	0.000563615	mg/kg	30-150	30	30-150	50	50			
Heptachlor epoxide	1024-57-3	0.0030015	0.00090045	mg/kg	30-150	30	30-150	50	50			
Endrin	72-20-8	0.000667	0.00027347	mg/kg	30-150	30	30-150	50	50			
Endrin aldehyde	7421-93-4	0.002001	0.00070035	mg/kg	30-150	30	30-150	50	50			
Endrin ketone	53494-70-5	0.0016008	0.000412206	mg/kg	30-150	30	30-150	50	50			
Dieldrin	60-57-1	0.0010005	0.00050025	mg/kg	30-150	30	30-150	50	50			
4,4'-DDE	72-55-9	0.0016008	0.000370185	mg/kg	30-150	30	30-150	50	50			
4,4'-DDD	72-54-8	0.0016008	0.000570952	mg/kg	30-150	30	30-150	50	50			
4,4'-DDT	50-29-3	0.0030015	0.00128731	mg/kg	30-150	30	30-150	50	50			
Endosulfan I	959-98-8	0.0016008	0.000378189	mg/kg	30-150	30	30-150	50	50			
Endosulfan II	33213-65-9	0.0016008	0.000534934	mg/kg	30-150	30	30-150	50	50			
Endosulfan sulfate	1031-07-8	0.000667	0.000317492	mg/kg	30-150	30	30-150	50	50			
Methoxychlor	72-43-5	0.0030015	0.0009338	mg/kg	30-150	30	30-150	50	50			
Toxaphene	8001-35-2	0.030015	0.0084042	mg/kg	30-150	30	30-150	50	50			
cis-Chlordane	5103-71-9	0.002001	0.000557612	mg/kg	30-150	30	30-150	50	50			
trans-Chlordane	5103-74-2	0.002001	0.000528264	mg/kg	30-150	30	30-150	50	50			
Chlordane	57-74-9	0.0130065	0.00530265	mg/kg	30-150	30	30-150	50	50			
2,4,5,6-Tetrachloro-m-xylene	877-09-8										30-150	
Decachlorobiphenyl	2051-24-3										30-150	

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Date Created: 05/16/19  
 Created By: Tom Tanico  
 File: PM6660-1  
 Page: 1

TCL Volatiles - EPA 8260C/5035 High&Low (SOIL)

Holding Time: 14 days  
 Container/Sample Preservation: 1 - 1 Vial MeOH/2 Vial Water

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria
Methylene chloride	75-09-2	5	2.29	ug/kg	70-130	30	70-130	30	30	
1,1-Dichloroethane	75-34-3	1	0.145	ug/kg	70-130	30	70-130	30	30	
Chloroform	67-66-3	1.5	0.14	ug/kg	70-130	30	70-130	30	30	
Carbon tetrachloride	56-23-5	1	0.23	ug/kg	70-130	30	70-130	30	30	
1,2-Dichloropropane	78-87-5	1	0.125	ug/kg	70-130	30	70-130	30	30	
Dibromochloromethane	124-48-1	1	0.14	ug/kg	70-130	30	70-130	30	30	
1,1,2-Trichloroethane	79-00-5	1	0.267	ug/kg	70-130	30	70-130	30	30	
Tetrachloroethene	127-18-4	0.5	0.196	ug/kg	70-130	30	70-130	30	30	
Chlorobenzene	108-90-7	0.5	0.127	ug/kg	70-130	30	70-130	30	30	
Trichlorofluoromethane	75-69-4	4	0.695	ug/kg	70-139	30	70-139	30	30	
1,2-Dichloroethane	107-06-2	1	0.257	ug/kg	70-130	30	70-130	30	30	
1,1,1-Trichloroethane	71-55-6	0.5	0.167	ug/kg	70-130	30	70-130	30	30	
Bromodichloromethane	75-27-4	0.5	0.109	ug/kg	70-130	30	70-130	30	30	
trans-1,3-Dichloropropene	10061-02-6	1	0.273	ug/kg	70-130	30	70-130	30	30	
cis-1,3-Dichloropropene	10061-01-5	0.5	0.158	ug/kg	70-130	30	70-130	30	30	
1,3-Dichloropropene, Total	542-75-6	0.5	0.158	ug/kg				30	30	
1,1-Dichloropropene	563-58-6	0.5	0.159	ug/kg	70-130	30	70-130	30	30	
Bromoform	75-25-2	4	0.246	ug/kg	70-130	30	70-130	30	30	
1,1,2,2-Tetrachloroethane	79-34-5	0.5	0.166	ug/kg	70-130	30	70-130	30	30	
Benzene	71-43-2	0.5	0.166	ug/kg	70-130	30	70-130	30	30	
Toluene	108-88-3	1	0.543	ug/kg	70-130	30	70-130	30	30	
Ethylbenzene	100-41-4	1	0.141	ug/kg	70-130	30	70-130	30	30	
Chloromethane	74-87-3	4	0.932	ug/kg	52-130	30	52-130	30	30	
Bromomethane	74-83-9	2	0.581	ug/kg	57-147	30	57-147	30	30	
Vinyl chloride	75-01-4	1	0.335	ug/kg	67-130	30	67-130	30	30	
Chloroethane	75-00-3	2	0.452	ug/kg	50-151	30	50-151	30	30	
1,1-Dichloroethene	75-35-4	1	0.238	ug/kg	65-135	30	65-135	30	30	
trans-1,2-Dichloroethene	156-60-5	1.5	0.137	ug/kg	70-130	30	70-130	30	30	
Trichloroethene	79-01-6	0.5	0.137	ug/kg	70-130	30	70-130	30	30	
1,2-Dichlorobenzene	95-50-1	2	0.144	ug/kg	70-130	30	70-130	30	30	
1,3-Dichlorobenzene	541-73-1	2	0.148	ug/kg	70-130	30	70-130	30	30	
1,4-Dichlorobenzene	106-46-7	2	0.171	ug/kg	70-130	30	70-130	30	30	
Methyl tert butyl ether	1634-04-4	2	0.201	ug/kg	66-130	30	66-130	30	30	
p/m-Xylene	179601-23-1	2	0.56	ug/kg	70-130	30	70-130	30	30	
o-Xylene	95-47-6	1	0.291	ug/kg	70-130	30	70-130	30	30	
Xylene (Total)	1330-20-7	1	0.291	ug/kg				30	30	
cis-1,2-Dichloroethene	156-59-2	1	0.175	ug/kg	70-130	30	70-130	30	30	
1,2-Dichloroethene (total)	540-59-0	1	0.137	ug/kg				30	30	
Dibromomethane	74-95-3	2	0.238	ug/kg	70-130	30	70-130	30	30	
Styrene	100-42-5	1	0.196	ug/kg	70-130	30	70-130	30	30	
Dichlorodifluoromethane	75-71-8	10	0.915	ug/kg	30-146	30	30-146	30	30	
Acetone	67-64-1	10	4.811	ug/kg	54-140	30	54-140	30	30	

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 File: PM6660-1  
 Page: 2

TCL Volatiles - EPA 8260C/5035 High&Low (SOIL)

Holding Time: 14 days  
 Container/Sample Preservation: 1 - 1 Vial MeOH/2 Vial Water

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria
Carbon disulfide	75-15-0	10	4.55	ug/kg	59-130	30	59-130	30	30	
2-Butanone	78-93-3	10	2.22	ug/kg	70-130	30	70-130	30	30	
Vinyl acetate	108-05-4	10	2.15	ug/kg	70-130	30	70-130	30	30	
4-Methyl-2-pentanone	108-10-1	10	1.28	ug/kg	70-130	30	70-130	30	30	
1,2,3-Trichloropropane	96-18-4	2	0.127	ug/kg	68-130	30	68-130	30	30	
2-Hexanone	591-78-6	10	1.18	ug/kg	70-130	30	70-130	30	30	
Bromochloromethane	74-97-5	2	0.205	ug/kg	70-130	30	70-130	30	30	
2,2-Dichloropropane	594-20-7	2	0.202	ug/kg	70-130	30	70-130	30	30	
1,2-Dibromoethane	106-93-4	1	0.279	ug/kg	70-130	30	70-130	30	30	
1,3-Dichloropropane	142-28-9	2	0.167	ug/kg	69-130	30	69-130	30	30	
1,1,1,2-Tetrachloroethane	630-20-6	0.5	0.132	ug/kg	70-130	30	70-130	30	30	
Bromobenzene	108-86-1	2	0.145	ug/kg	70-130	30	70-130	30	30	
n-Butylbenzene	104-51-8	1	0.167	ug/kg	70-130	30	70-130	30	30	
sec-Butylbenzene	135-98-8	1	0.146	ug/kg	70-130	30	70-130	30	30	
tert-Butylbenzene	98-06-6	2	0.118	ug/kg	70-130	30	70-130	30	30	
o-Chlorotoluene	95-49-8	2	0.191	ug/kg	70-130	30	70-130	30	30	
p-Chlorotoluene	106-43-4	2	0.108	ug/kg	70-130	30	70-130	30	30	
1,2-Dibromo-3-chloropropane	96-12-8	3	0.998	ug/kg	68-130	30	68-130	30	30	
Hexachlorobutadiene	87-68-3	4	0.169	ug/kg	67-130	30	67-130	30	30	
Isopropylbenzene	98-82-8	1	0.109	ug/kg	70-130	30	70-130	30	30	
p-Isopropyltoluene	99-87-6	1	0.109	ug/kg	70-130	30	70-130	30	30	
Naphthalene	91-20-3	4	0.65	ug/kg	70-130	30	70-130	30	30	
Acrylonitrile	107-13-1	4	1.15	ug/kg	70-130	30	70-130	30	30	
n-Propylbenzene	103-65-1	1	0.171	ug/kg	70-130	30	70-130	30	30	
1,2,3-Trichlorobenzene	87-61-6	2	0.322	ug/kg	70-130	30	70-130	30	30	
1,2,4-Trichlorobenzene	120-82-1	2	0.272	ug/kg	70-130	30	70-130	30	30	
1,3,5-Trimethylbenzene	108-67-8	2	0.193	ug/kg	70-130	30	70-130	30	30	
1,2,4-Trimethylbenzene	95-63-6	2	0.334	ug/kg	70-130	30	70-130	30	30	
1,4-Dioxane	123-91-1	80	35.1	ug/kg	65-136	30	65-136	30	30	
1,4-Diethylbenzene	105-05-5	2	0.177	ug/kg	70-130	30	70-130	30	30	
4-Ethyltoluene	622-96-8	2	0.384	ug/kg	70-130	30	70-130	30	30	
1,2,4,5-Tetramethylbenzene	95-93-2	2	0.191	ug/kg	70-130	30	70-130	30	30	
Ethyl ether	60-29-7	2	0.341	ug/kg	67-130	30	67-130	30	30	
trans-1,4-Dichloro-2-butene	110-57-6	5	1.42	ug/kg	70-130	30	70-130	30	30	
1,2-Dichloroethane-d4	17060-07-0									70-130
2-Chloroethoxyethane										
Toluene-d8	2037-26-5									70-130
4-Bromofluorobenzene	460-00-4									70-130
Dibromofluoromethane	1868-53-7									70-130

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 Created By: Tom Tanico  
 File: PM6660-1  
 Page: 1

NYTCL Semivolatiles - EPA 8270D (SOIL)

Holding Time: 14 days  
 Container/Sample Preservation: 1 - Glass 250ml/8oz unreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria
Acenaphthene	83-32-9	133.6	17.3012	ug/kg	31-137	50	31-137	50	50	
1,2,4-Trichlorobenzene	120-82-1	167	19.1048	ug/kg	38-107	50	38-107	50	50	
Hexachlorobenzene	118-74-1	100.2	18.704	ug/kg	40-140	50	40-140	50	50	
Bis(2-chloroethyl)ether	111-44-4	150.3	22.6452	ug/kg	40-140	50	40-140	50	50	
2-Chloronaphthalene	91-58-7	167	16.5664	ug/kg	40-140	50	40-140	50	50	
1,2-Dichlorobenzene	95-50-1	167	29.9932	ug/kg	40-140	50	40-140	50	50	
1,3-Dichlorobenzene	541-73-1	167	28.724	ug/kg	40-140	50	40-140	50	50	
1,4-Dichlorobenzene	106-46-7	167	29.1582	ug/kg	28-104	50	28-104	50	50	
3,3'-Dichlorobenzidine	91-94-1	167	44.422	ug/kg	40-140	50	40-140	50	50	
2,4-Dinitrotoluene	121-14-2	167	33.4	ug/kg	40-132	50	40-132	50	50	
2,6-Dinitrotoluene	606-20-2	167	28.6572	ug/kg	40-140	50	40-140	50	50	
Fluoranthene	206-44-0	100.2	19.1716	ug/kg	40-140	50	40-140	50	50	
4-Chlorophenyl phenyl ether	7005-72-3	167	17.869	ug/kg	40-140	50	40-140	50	50	
4-Bromophenyl phenyl ether	101-55-3	167	25.4842	ug/kg	40-140	50	40-140	50	50	
Bis(2-chloroisopropyl)ether	108-60-1	200.4	28.5236	ug/kg	40-140	50	40-140	50	50	
Bis(2-chloroethoxy)methane	111-91-1	180.36	16.7334	ug/kg	40-117	50	40-117	50	50	
Hexachlorobutadiene	87-68-3	167	24.4488	ug/kg	40-140	50	40-140	50	50	
Hexachlorocyclopentadiene	77-47-4	477.62	151.302	ug/kg	40-140	50	40-140	50	50	
Hexachloroethane	67-72-1	133.6	27.0206	ug/kg	40-140	50	40-140	50	50	
Isophorone	78-59-1	150.3	21.6766	ug/kg	40-140	50	40-140	50	50	
Naphthalene	91-20-3	167	20.3406	ug/kg	40-140	50	40-140	50	50	
Nitrobenzene	98-95-3	150.3	24.716	ug/kg	40-140	50	40-140	50	50	
NitrosoDiPhenylAmine(NDPA)/DPA	86-30-6	133.6	19.0046	ug/kg	36-157	50	36-157	50	50	
n-Nitrosodi-n-propylamine	621-64-7	167	25.7848	ug/kg	32-121	50	32-121	50	50	
Bis(2-Ethylhexyl)phthalate	117-81-7	167	57.782	ug/kg	40-140	50	40-140	50	50	
Butyl benzyl phthalate	85-68-7	167	42.084	ug/kg	40-140	50	40-140	50	50	
Di-n-butylphthalate	84-74-2	167	31.6632	ug/kg	40-140	50	40-140	50	50	
Di-n-octylphthalate	117-84-0	167	56.78	ug/kg	40-140	50	40-140	50	50	
Diethyl phthalate	84-66-2	167	15.4642	ug/kg	40-140	50	40-140	50	50	
Dimethyl phthalate	131-11-3	167	35.07	ug/kg	40-140	50	40-140	50	50	
Benzo(a)anthracene	56-55-3	100.2	18.8042	ug/kg	40-140	50	40-140	50	50	
Benzo(a)pyrene	50-32-8	133.6	40.748	ug/kg	40-140	50	40-140	50	50	
Benzo(b)fluoranthene	205-99-2	100.2	28.1228	ug/kg	40-140	50	40-140	50	50	
Benzo(k)fluoranthene	207-08-9	100.2	26.72	ug/kg	40-140	50	40-140	50	50	
Chrysene	218-01-9	100.2	17.368	ug/kg	40-140	50	40-140	50	50	
Acenaphthylene	208-96-8	133.6	25.7848	ug/kg	40-140	50	40-140	50	50	
Anthracene	120-12-7	100.2	32.565	ug/kg	40-140	50	40-140	50	50	
Benzo(ghi)perylene	191-24-2	133.6	19.6392	ug/kg	40-140	50	40-140	50	50	
Fluorene	86-73-7	167	16.2324	ug/kg	40-140	50	40-140	50	50	
Phenanthrene	85-01-8	100.2	20.3072	ug/kg	40-140	50	40-140	50	50	
Dibenzo(a,h)anthracene	53-70-3	100.2	19.3052	ug/kg	40-140	50	40-140	50	50	
Indeno(1,2,3-cd)Pyrene	193-39-5	133.6	23.2798	ug/kg	40-140	50	40-140	50	50	

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 File: PM6660-1  
 Page: 2

NYTCL Semivolatiles - EPA 8270D (SOIL)

Holding Time: 14 days  
 Container/Sample Preservation: 1 - Glass 250ml/8oz unreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria
Pyrene	129-00-0	100.2	16.5998	ug/kg	35-142	50	35-142	50	50	
Biphenyl	92-52-4	380.76	38.744	ug/kg	54-104	50	54-104	50	50	
4-Chloroaniline	106-47-8	167	30.394	ug/kg	40-140	50	40-140	50	50	
2-Nitroaniline	88-74-4	167	32.1976	ug/kg	47-134	50	47-134	50	50	
3-Nitroaniline	99-09-2	167	31.4962	ug/kg	26-129	50	26-129	50	50	
4-Nitroaniline	100-01-6	167	69.138	ug/kg	41-125	50	41-125	50	50	
Dibenzofuran	132-64-9	167	15.7982	ug/kg	40-140	50	40-140	50	50	
2-Methylnaphthalene	91-57-6	200.4	20.1736	ug/kg	40-140	50	40-140	50	50	
Acetophenone	98-86-2	167	20.6746	ug/kg	14-144	50	14-144	50	50	
2,4,6-Trichlorophenol	88-06-2	100.2	31.6632	ug/kg	30-130	50	30-130	50	50	
p-Chloro-M-Cresol	59-50-7	167	24.883	ug/kg	26-103	50	26-103	50	50	
2-Chlorophenol	95-57-8	167	19.7394	ug/kg	25-102	50	25-102	50	50	
2,4-Dichlorophenol	120-83-2	150.3	26.8536	ug/kg	30-130	50	30-130	50	50	
2,4-Dimethylphenol	105-67-9	167	55.11	ug/kg	30-130	50	30-130	50	50	
2-Nitrophenol	88-75-5	360.72	62.792	ug/kg	30-130	50	30-130	50	50	
4-Nitrophenol	100-02-7	233.8	68.136	ug/kg	11-114	50	11-114	50	50	
2,4-Dinitrophenol	51-28-5	801.6	77.822	ug/kg	4-130	50	4-130	50	50	
4,6-Dinitro-o-cresol	534-52-1	434.2	80.16	ug/kg	10-130	50	10-130	50	50	
Pentachlorophenol	87-86-5	133.6	36.74	ug/kg	17-109	50	17-109	50	50	
Phenol	108-95-2	167	25.217	ug/kg	26-90	50	26-90	50	50	
2-Methylphenol	95-48-7	167	25.885	ug/kg	30-130	50	30-130	50	50	
3-Methylphenol/4-Methylphenol	108-39-4/106-44-5	240.48	26.1522	ug/kg	30-130	50	30-130	50	50	
2,4,5-Trichlorophenol	95-95-4	167	31.9972	ug/kg	30-130	50	30-130	50	50	
Benzoic Acid	65-85-0	541.08	169.004	ug/kg	10-110	50	10-110	50	50	
Benzyl Alcohol	100-51-6	167	51.102	ug/kg	40-140	50	40-140	50	50	
Carbazole	86-74-8	167	16.2324	ug/kg	54-128	50	54-128	50	50	
2-Fluorophenol	367-12-4									25-120
Phenol-d6	13127-88-3									10-120
Nitrobenzene-d5	4165-60-0									23-120
2-Fluorobiphenyl	321-60-8									30-120
2,4,6-Tribromophenol	118-79-6									10-136
4-Terphenyl-d14	1718-51-0									18-120

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 File: PM6660-1  
 Page: 1

NY PFAAs via EPA 537(M)-Isotope Dilution (SOIL)

Holding Time: 28 days  
 Container/Sample Preservation: 1 - Plastic 8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria
Perfluorobutanoic Acid (PFBA)	375-22-4	1	0.0213	ng/g	71-135	30	71-135	30	30	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	1	0.01035	ng/g	69-132	30	69-132	30	30	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	1	0.0635	ng/g	72-128	30	72-128	30	30	
Perfluorohexanoic Acid (PFHxA)	307-24-4	1	0.064	ng/g	70-132	30	70-132	30	30	
Perfluoroheptanoic Acid (PFHpA)	375-85-9	1	0.064	ng/g	71-131	30	71-131	30	30	
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	1	0.057	ng/g	67-130	30	67-130	30	30	
Perfluorooctanoic Acid (PFOA)	335-67-1	1	0.04105	ng/g	69-133	30	69-133	30	30	
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	1	0.198	ng/g	64-140	30	64-140	30	30	
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	1	0.136	ng/g	70-132	30	70-132	30	30	
Perfluorononanoic Acid (PFNA)	375-95-1	1	0.083	ng/g	72-129	30	72-129	30	30	
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	1	0.1205	ng/g	68-136	30	68-136	30	30	
Perfluorodecanoic Acid (PFDA)	335-76-2	1	0.072	ng/g	69-133	30	69-133	30	30	
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	1	0.275	ng/g	65-137	30	65-137	30	30	
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSA)	2355-31-9	1	0.103	ng/g	63-144	30	63-144	30	30	
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	1	0.056	ng/g	64-136	30	64-136	30	30	
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	1	0.097	ng/g	59-134	30	59-134	30	30	
Perfluorooctanesulfonamide (FOSA)	754-91-6	1	0.1025	ng/g	67-137	30	67-137	30	30	
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	1	0.09	ng/g	61-139	30	61-139	30	30	
Perfluorododecanoic Acid (PFDoA)	307-55-1	1	0.086	ng/g	69-135	30	69-135	30	30	
Perfluorotridecanoic Acid (PFTTrDA)	72629-94-8	1	0.062	ng/g	66-139	30	66-139	30	30	
Perfluorotetradecanoic Acid (PFTTA)	376-06-7	1	0.07	ng/g	69-133	30	69-133	30	30	
PFOA/PFOS, Total		1	0.04105	ng/g				30	30	
Perfluoro[13C4]Butanoic Acid (MPFBA)	NONE									60-153
Perfluoro[13C5]Pentanoic Acid (MSPPEA)	NONE									65-182
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	NONE									70-151
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	NONE									61-147
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	NONE									62-149
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	NONE									63-166
Perfluoro[13C8]Octanoic Acid (M8PFOA)	NONE									62-152
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-8)	NONE									32-182
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	NONE									61-154
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	NONE									65-151
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	NONE									65-150
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8)	NONE									25-186
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid	NONE									45-137
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	NONE									64-158
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	NONE									1-125
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d)	NONE									42-136
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	NONE									56-148
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	NONE									26-160

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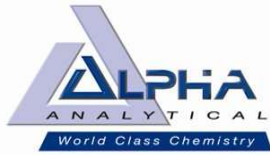
**TCL PCBs - EPA 8082A (SOIL)**

**Holding Time:** 14 days  
**Container/Sample Preservation:** 1 - Glass 250ml/8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Aroclor 1016	12674-11-2	33.5	2.9748	ug/kg	40-140	50	40-140	50	50			
Aroclor 1221	11104-28-2	33.5	3.3567	ug/kg	40-140	50	40-140	50	50			
Aroclor 1232	11141-16-5	33.5	7.102	ug/kg	40-140	50	40-140	50	50			
Aroclor 1242	53469-21-9	33.5	4.5158	ug/kg	40-140	50	40-140	50	50			
Aroclor 1248	12672-29-6	33.5	5.025	ug/kg	40-140	50	40-140	50	50			
Aroclor 1254	11097-69-1	33.5	3.6649	ug/kg	40-140	50	40-140	50	50			
Aroclor 1260	11096-82-5	33.5	6.1908	ug/kg	40-140	50	40-140	50	50			
Aroclor 1262	37324-23-5	33.5	4.2545	ug/kg	40-140	50	40-140	50	50			
Aroclor 1268	11100-14-4	33.5	3.4706	ug/kg	40-140	50	40-140	50	50			
PCBs, Total	1336-36-3	33.5	2.9748	ug/kg				50	50			
2,4,5,6-Tetrachloro-m-xylene	877-09-8											30-150
Decachlorobiphenyl	2051-24-3											30-150

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Page: 1

WETCHEM (SOIL)

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Method	Holding Time	Container/Sample Preservation
Chromium, Hexavalent	18540-29-9	0.8	0.16	mg/kg	80-120	20	75-125	20	20	7196A	30 days	1 - Glass 120ml/4oz unpreserved
Cyanide, Total	57-12-5	1	0.212	mg/kg	80-120	35	75-125	35	35	9010C/9012B	14 days	1 - Glass 250ml/8oz unpreserved

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 File: PM6661-1  
 Page: 1

Volatile Organics in Air: TO-15 (SOIL\_VAPOR)

Holding Time: 30 days  
 Container/Sample Preservation: 1 - Canister - 2.7 Liter

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria
1,1,1-Trichloroethane	71-55-6	0.2	0.0554	ppbV	70-130			25	25	
1,1,2,2-Tetrachloroethane	79-34-5	0.2	0.0611	ppbV	70-130			25	25	
1,1,2-Trichloroethane	79-00-5	0.2	0.0694	ppbV	70-130			25	25	
1,1-Dichloroethane	75-34-3	0.2	0.0628	ppbV	70-130			25	25	
1,1-Dichloroethene	75-35-4	0.2	0.0613	ppbV	70-130			25	25	
1,2,3-Trimethylbenzene	526-73-8	0.2	0.0636	ppbV	70-130			25	25	
1,2,4-Trichlorobenzene	120-82-1	0.2	0.0759	ppbV	70-130			25	25	
1,2,4-Trimethylbenzene	95-63-6	0.2	0.0416	ppbV	70-130			25	25	
1,2,4,5-Tetramethylbenzene	95-93-2	0.2	0.068	ppbV	70-130			25	25	
1,2-Dibromoethane	106-93-4	0.2	0.0577	ppbV	70-130			25	25	
1,2-Dichlorobenzene	95-50-1	0.2	0.0653	ppbV	70-130			25	25	
1,2-Dichloroethane	107-06-2	0.2	0.0634	ppbV	70-130			25	25	
1,2-Dichloropropane	78-87-5	0.2	0.062	ppbV	70-130			25	25	
1,3,5-Trimethylbenzene	108-67-8	0.2	0.0737	ppbV	70-130			25	25	
1,3-Butadiene	106-99-0	0.2	0.063	ppbV	70-130			25	25	
1,3-Dichlorobenzene	541-73-1	0.2	0.0658	ppbV	70-130			25	25	
1,4-Dichlorobenzene	106-46-7	0.2	0.0681	ppbV	70-130			25	25	
1,4-Dioxane	123-91-1	0.2	0.0903	ppbV	70-130			25	25	
2,2,4-Trimethylpentane	540-84-1	0.2	0.0391	ppbV	70-130			25	25	
2-Butanone	78-93-3	0.5	0.0476	ppbV	70-130			25	25	
2-Hexanone	591-78-6	0.2	0.0662	ppbV	70-130			25	25	
2-Methylthiophene	554-14-3	0.2	0.0577	ppbV	70-130			25	25	
3-Methylthiophene	616-44-4	0.2	0.0577	ppbV	70-130			25	25	
3-Chloropropene	107-05-1	0.2	0.0517	ppbV	70-130			25	25	
2-Ethylthiophene	872-55-9	0.2	0.0455	ppbV	70-130			25	25	
4-Ethyltoluene	622-96-8	0.2	0.041	ppbV	70-130			25	25	
Acetone	67-64-1	1	0.544	ppbV	40-160			25	25	
Benzene	71-43-2	0.2	0.0494	ppbV	70-130			25	25	
Benzyl chloride	100-44-7	0.2	0.0545	ppbV	70-130			25	25	
Benzothiophene	95-15-8	0.5	0.0863	ppbV	70-130			25	25	
Bromodichloromethane	75-27-4	0.2	0.0534	ppbV	70-130			25	25	
Bromoform	75-25-2	0.2	0.0711	ppbV	70-130			25	25	
Bromomethane	74-83-9	0.2	0.0713	ppbV	70-130			25	25	
Carbon disulfide	75-15-0	0.2	0.0552	ppbV	70-130			25	25	
Carbon tetrachloride	56-23-5	0.2	0.0561	ppbV	70-130			25	25	
Chlorobenzene	108-90-7	0.2	0.0634	ppbV	70-130			25	25	
Chloroethane	75-00-3	0.2	0.0785	ppbV	70-130			25	25	
Chloroform	67-66-3	0.2	0.0632	ppbV	70-130			25	25	
Chloromethane	74-87-3	0.2	0.0735	ppbV	70-130			25	25	
cis-1,2-Dichloroethene	156-59-2	0.2	0.12	ppbV	70-130			25	25	
cis-1,3-Dichloropropene	10061-01-5	0.2	0.0461	ppbV	70-130			25	25	
Cyclohexane	110-82-7	0.2	0.0389	ppbV	70-130			25	25	

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 File: PM6661-1  
 Page: 2

Volatile Organics in Air: TO-15 (SOIL\_VAPOR)

Holding Time: 30 days  
 Container/Sample Preservation: 1 - Canister - 2.7 Liter

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria
Dibromochloromethane	124-48-1	0.2	0.0671	ppbV	70-130			25	25	
Dichlorodifluoromethane	75-71-8	0.2	0.0599	ppbV	70-130			25	25	
Ethyl Alcohol	64-17-5	5	0.788	ppbV	40-160			25	25	
Ethyl Acetate	141-78-6	0.5	0.137	ppbV	70-130			25	25	
Ethylbenzene	100-41-4	0.2	0.0467	ppbV	70-130			25	25	
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	0.2	0.0649	ppbV	70-130			25	25	
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	0.2	0.0609	ppbV	70-130			25	25	
Hexachlorobutadiene	87-68-3	0.2	0.0555	ppbV	70-130			25	25	
iso-Propyl Alcohol	67-63-0	0.5	0.348	ppbV	40-160			25	25	
Methylene chloride	75-09-2	0.5	0.07	ppbV	70-130			25	25	
4-Methyl-2-pentanone	108-10-1	0.5	0.0464	ppbV	70-130			25	25	
Methyl tert butyl ether	1634-04-4	0.2	0.0571	ppbV	70-130			25	25	
Methyl Methacrylate	80-62-6	0.5	0.06	ppbV	40-160			25	25	
p/m-Xylene	179601-23-1	0.4	0.101	ppbV	70-130			25	25	
o-Xylene	95-47-6	0.2	0.051	ppbV	70-130			25	25	
Xylene (Total)	1330-20-7	0.2	0.051	ppbV				25	25	
Heptane	142-82-5	0.2	0.0529	ppbV	70-130			25	25	
n-Heptane	142-82-5	0.2	0.0529	ppbV	70-130			25	25	
n-Hexane	110-54-3	0.2	0.0364	ppbV	70-130			25	25	
Propylene	115-07-1	0.5	0.0669	ppbV	70-130			25	25	
Styrene	100-42-5	0.2	0.0476	ppbV	70-130			25	25	
Tetrachloroethene	127-18-4	0.2	0.0673	ppbV	70-130			25	25	
Thiophene	110-02-1	0.2	0.0428	ppbV	70-130			25	25	
Tetrahydrofuran	109-99-9	0.5	0.0634	ppbV	70-130			25	25	
Toluene	108-88-3	0.2	0.0545	ppbV	70-130			25	25	
trans-1,2-Dichloroethene	156-60-5	0.2	0.0645	ppbV	70-130			25	25	
1,2-Dichloroethene (total)	540-59-0	0.2	0.0645	ppbV				25	25	
trans-1,3-Dichloropropene	10061-02-6	0.2	0.0491	ppbV	70-130			25	25	
1,3-Dichloropropene, Total	542-75-6	0.2	0.0461	ppbV				25	25	
Trichloroethene	79-01-6	0.2	0.0512	ppbV	70-130			25	25	
Trichlorofluoromethane	75-69-4	0.2	0.0755	ppbV	70-130			25	25	
Vinyl acetate	108-05-4	1	0.0508	ppbV	70-130			25	25	
Vinyl bromide	593-60-2	0.2	0.0696	ppbV	70-130			25	25	
Vinyl chloride	75-01-4	0.2	0.0598	ppbV	70-130			25	25	
Naphthalene	91-20-3	0.2	0.0984	ppbV	70-130			25	25	
Total HC As Hexane	NONE	10	0.0364	ppbV	70-130			25	25	
Total VOCs As Toluene	NONE	10	0.0545	ppbV	70-130			25	25	
Propane	74-98-6	0.5	0.149	ppbV	70-130			25	25	
Acrylonitrile	107-13-1	0.5	0.0544	ppbV	70-130			25	25	
Acrolein	107-02-8	0.5	0.0545	ppbV	70-130			25	25	
1,1,1,2-Tetrachloroethane	630-20-6	0.2	0.0591	ppbV	70-130			25	25	
Isopropylbenzene	98-82-8	0.2	0.0516	ppbV	70-130			25	25	

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 File: PM6661-1  
 Page: 3

Volatile Organics in Air: TO-15 (SOIL\_VAPOR)

Holding Time: 30 days  
 Container/Sample Preservation: 1 - Canister - 2.7 Liter

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria
1,2,3-Trichloropropane	96-18-4	0.2	0.0592	ppbV	70-130			25	25	
Acetonitrile	75-05-8	0.2	0.0745	ppbV	70-130			25	25	
Bromobenzene	108-86-1	0.2	0.064	ppbV	70-130			25	25	
Chlorodifluoromethane	75-45-6	0.2	0.0599	ppbV	70-130			25	25	
Dichlorofluoromethane	75-43-4	0.2	0.0835	ppbV	70-130			25	25	
Dibromomethane	74-95-3	0.2	0.0597	ppbV	70-130			25	25	
Pentane	109-66-0	0.2	0.0656	ppbV	70-130			25	25	
Octane	111-65-9	0.2	0.0495	ppbV	70-130			25	25	
Tertiary-Amyl Methyl Ether	994-05-8	0.2	0.0532	ppbV	70-130			25	25	
o-Chlorotoluene	95-49-8	0.2	0.0517	ppbV	70-130			25	25	
p-Chlorotoluene	106-43-4	0.2	0.0574	ppbV	70-130			25	25	
2,2-Dichloropropane	594-20-7	0.2	0.0514	ppbV	70-130			25	25	
1,1-Dichloropropene	563-58-6	0.2	0.0512	ppbV	70-130			25	25	
Isopropyl Ether	108-20-3	0.2	0.0978	ppbV	70-130			25	25	
Ethyl-Tert-Butyl-Ether	637-92-3	0.2	0.0656	ppbV	70-130			25	25	
1,2,3-Trichlorobenzene	87-61-6	0.2	0.0756	ppbV	70-130			25	25	
Ethyl ether	60-29-7	0.2	0.0795	ppbV	70-130			25	25	
n-Butylbenzene	104-51-8	0.2	0.049	ppbV	70-130			25	25	
sec-Butylbenzene	135-98-8	0.2	0.0469	ppbV	70-130			25	25	
tert-Butylbenzene	98-06-6	0.2	0.0464	ppbV	70-130			25	25	
1,2-Dibromo-3-chloropropane	96-12-8	0.2	0.0557	ppbV	70-130			25	25	
p-Isopropyltoluene	99-87-6	0.2	0.058	ppbV	70-130			25	25	
n-Propylbenzene	103-65-1	0.2	0.0462	ppbV	70-130			25	25	
1,3-Dichloropropane	142-28-9	0.2	0.0601	ppbV	70-130			25	25	
Methanol	67-56-1	5	0.616	ppbV	70-130			25	25	
Acetaldehyde	75-07-0	2.5	0.499	ppbV	70-130			25	25	
Butane	106-97-8	0.2	0.0659	ppbV	70-130			25	25	
Nonane (C9)	111-84-2	0.2	0.0523	ppbV	70-130			25	25	
Decane (C10)	124-18-5	0.2	0.0448	ppbV	70-130			25	25	
Undecane	1120-21-4	0.2	0.0478	ppbV	70-130			25	25	
Indane	496-11-7	0.2	0.0534	ppbV	70-130			25	25	
Indene	95-13-6	0.2	0.0474	ppbV	70-130			25	25	
1-Methylnaphthalene	90-12-0	1	0.518	ppbV	70-130			25	25	
Dodecane (C12)	112-40-3	0.2	0.0719	ppbV	70-130			25	25	
Butyl Acetate	123-86-4	0.5	0.127	ppbV	70-130			25	25	
tert-Butyl Alcohol	75-65-0	0.5	0.0446	ppbV	70-130			25	25	
2-Methylnaphthalene	91-57-6	1	0.428	ppbV	70-130			25	25	
1,2-Dichloroethane-d4	17060-07-0									70-130
Toluene-d8	2037-26-5									70-130
Bromofluorobenzene	460-00-4									70-130

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 File: PM6658-1  
 Page: 1

TCL Volatiles - EPA 8260C (WATER)

Holding Time: 14 days  
 Container/Sample Preservation: 3 - Vial HCl preserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria
Methylene chloride	75-09-2	2.5	0.7	ug/l	70-130	20	70-130	20	20	
1,1-Dichloroethane	75-34-3	2.5	0.7	ug/l	70-130	20	70-130	20	20	
Chloroform	67-66-3	2.5	0.7	ug/l	70-130	20	70-130	20	20	
Carbon tetrachloride	56-23-5	0.5	0.134	ug/l	63-132	20	63-132	20	20	
1,2-Dichloropropane	78-87-5	1	0.133	ug/l	70-130	20	70-130	20	20	
Dibromochloromethane	124-48-1	0.5	0.149	ug/l	63-130	20	63-130	20	20	
1,1,2-Trichloroethane	79-00-5	1.5	0.5	ug/l	70-130	20	70-130	20	20	
Tetrachloroethene	127-18-4	0.5	0.181	ug/l	70-130	20	70-130	20	20	
Chlorobenzene	108-90-7	2.5	0.7	ug/l	75-130	20	75-130	20	20	
Trichlorofluoromethane	75-69-4	2.5	0.7	ug/l	62-150	20	62-150	20	20	
1,2-Dichloroethane	107-06-2	0.5	0.132	ug/l	70-130	20	70-130	20	20	
1,1,1-Trichloroethane	71-55-6	2.5	0.7	ug/l	67-130	20	67-130	20	20	
Bromodichloromethane	75-27-4	0.5	0.192	ug/l	67-130	20	67-130	20	20	
trans-1,3-Dichloropropene	10061-02-6	0.5	0.164	ug/l	70-130	20	70-130	20	20	
cis-1,3-Dichloropropene	10061-01-5	0.5	0.144	ug/l	70-130	20	70-130	20	20	
1,3-Dichloropropene, Total	542-75-6	0.5	0.144	ug/l				20	20	
1,1-Dichloropropene	563-58-6	2.5	0.7	ug/l	70-130	20	70-130	20	20	
Bromoform	75-25-2	2	0.65	ug/l	54-136	20	54-136	20	20	
1,1,2,2-Tetrachloroethane	79-34-5	0.5	0.144	ug/l	67-130	20	67-130	20	20	
Benzene	71-43-2	0.5	0.159	ug/l	70-130	20	70-130	20	20	
Toluene	108-88-3	2.5	0.7	ug/l	70-130	20	70-130	20	20	
Ethylbenzene	100-41-4	2.5	0.7	ug/l	70-130	20	70-130	20	20	
Chloromethane	74-87-3	2.5	0.7	ug/l	64-130	20	64-130	20	20	
Bromomethane	74-83-9	2.5	0.7	ug/l	39-139	20	39-139	20	20	
Vinyl chloride	75-01-4	1	0.0699	ug/l	55-140	20	55-140	20	20	
Chloroethane	75-00-3	2.5	0.7	ug/l	55-138	20	55-138	20	20	
1,1-Dichloroethene	75-35-4	0.5	0.142	ug/l	61-145	20	61-145	20	20	
trans-1,2-Dichloroethene	156-60-5	2.5	0.7	ug/l	70-130	20	70-130	20	20	
Trichloroethene	79-01-6	0.5	0.175	ug/l	70-130	20	70-130	20	20	
1,2-Dichlorobenzene	95-50-1	2.5	0.7	ug/l	70-130	20	70-130	20	20	
1,3-Dichlorobenzene	541-73-1	2.5	0.7	ug/l	70-130	20	70-130	20	20	
1,4-Dichlorobenzene	106-46-7	2.5	0.7	ug/l	70-130	20	70-130	20	20	
Methyl tert butyl ether	1634-04-4	2.5	0.7	ug/l	63-130	20	63-130	20	20	
p/m-Xylene	179601-23-1	2.5	0.7	ug/l	70-130	20	70-130	20	20	
o-Xylene	95-47-6	2.5	0.7	ug/l	70-130	20	70-130	20	20	
Xylene (Total)	1330-20-7	2.5	0.7	ug/l				20	20	
cis-1,2-Dichloroethene	156-59-2	2.5	0.7	ug/l	70-130	20	70-130	20	20	
1,2-Dichloroethene (total)	540-59-0	2.5	0.7	ug/l				20	20	
Dibromomethane	74-95-3	5	1	ug/l	70-130	20	70-130	20	20	
1,2,3-Trichloropropane	96-18-4	2.5	0.7	ug/l	64-130	20	64-130	20	20	
Acrylonitrile	107-13-1	5	1.5	ug/l	70-130	20	70-130	20	20	
Styrene	100-42-5	2.5	0.7	ug/l	70-130	20	70-130	20	20	

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 File: PM6658-1  
 Page: 2

TCL Volatiles - EPA 8260C (WATER)

Holding Time: 14 days  
 Container/Sample Preservation: 3 - Vial HCl preserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria
Dichlorodifluoromethane	75-71-8	5	1	ug/l	36-147	20	36-147	20	20	
Acetone	67-64-1	5	1.46	ug/l	58-148	20	58-148	20	20	
Carbon disulfide	75-15-0	5	1	ug/l	51-130	20	51-130	20	20	
2-Butanone	78-93-3	5	1.94	ug/l	63-138	20	63-138	20	20	
Vinyl acetate	108-05-4	5	1	ug/l	70-130	20	70-130	20	20	
4-Methyl-2-pentanone	108-10-1	5	1	ug/l	59-130	20	59-130	20	20	
2-Hexanone	591-78-6	5	1	ug/l	57-130	20	57-130	20	20	
Bromochloromethane	74-97-5	2.5	0.7	ug/l	70-130	20	70-130	20	20	
2,2-Dichloropropane	594-20-7	2.5	0.7	ug/l	63-133	20	63-133	20	20	
1,2-Dibromoethane	106-93-4	2	0.65	ug/l	70-130	20	70-130	20	20	
1,3-Dichloropropane	142-28-9	2.5	0.7	ug/l	70-130	20	70-130	20	20	
1,1,1,2-Tetrachloroethane	630-20-6	2.5	0.7	ug/l	64-130	20	64-130	20	20	
Bromobenzene	108-86-1	2.5	0.7	ug/l	70-130	20	70-130	20	20	
n-Butylbenzene	104-51-8	2.5	0.7	ug/l	53-136	20	53-136	20	20	
sec-Butylbenzene	135-98-8	2.5	0.7	ug/l	70-130	20	70-130	20	20	
tert-Butylbenzene	98-06-6	2.5	0.7	ug/l	70-130	20	70-130	20	20	
o-Chlorotoluene	95-49-8	2.5	0.7	ug/l	70-130	20	70-130	20	20	
p-Chlorotoluene	106-43-4	2.5	0.7	ug/l	70-130	20	70-130	20	20	
1,2-Dibromo-3-chloropropane	96-12-8	2.5	0.7	ug/l	41-144	20	41-144	20	20	
Hexachlorobutadiene	87-68-3	2.5	0.7	ug/l	63-130	20	63-130	20	20	
Isopropylbenzene	98-82-8	2.5	0.7	ug/l	70-130	20	70-130	20	20	
p-Isopropyltoluene	99-87-6	2.5	0.7	ug/l	70-130	20	70-130	20	20	
Naphthalene	91-20-3	2.5	0.7	ug/l	70-130	20	70-130	20	20	
n-Propylbenzene	103-65-1	2.5	0.7	ug/l	69-130	20	69-130	20	20	
1,2,3-Trichlorobenzene	87-61-6	2.5	0.7	ug/l	70-130	20	70-130	20	20	
1,2,4-Trichlorobenzene	120-82-1	2.5	0.7	ug/l	70-130	20	70-130	20	20	
1,3,5-Trimethylbenzene	108-67-8	2.5	0.7	ug/l	64-130	20	64-130	20	20	
1,2,4-Trimethylbenzene	95-63-6	2.5	0.7	ug/l	70-130	20	70-130	20	20	
1,4-Dioxane	123-91-1	250	41.1	ug/l	56-162	20	56-162	20	20	
1,4-Diethylbenzene	105-05-5	2	0.7	ug/l	70-130	20	70-130	20	20	
4-Ethyltoluene	622-96-8	2	0.7	ug/l	70-130	20	70-130	20	20	
1,2,4,5-Tetramethylbenzene	95-93-2	2	0.65	ug/l	70-130	20	70-130	20	20	
Ethyl ether	60-29-7	2.5	0.7	ug/l	59-134	20	59-134	20	20	
trans-1,4-Dichloro-2-butene	110-57-6	2.5	0.7	ug/l	70-130	20	70-130	20	20	
1,2-Dichloroethane-d4	17060-07-0									70-130
Toluene-d8	2037-26-5									70-130
4-Bromofluorobenzene	460-00-4									70-130
Dibromofluoromethane	1868-53-7									70-130

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 File: PM6658-1  
 Page: 1

1,4 Dioxane via EPA 8270D-SIM (WATER)

Holding Time: 7 days  
 Container/Sample Preservation: 2 - Amber 250ml unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria
1,4-Dioxane	123-91-1	150	33.9	ng/l	40-140	30	40-140	30	30	
1,4-Dioxane-d8	17647-74-4									15-110
1,4-Dioxane-d8 (IS)	17647-74-4			ng/l						

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File: PM6658-1  
Page: 1

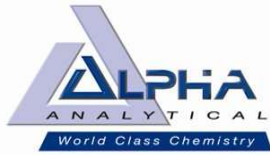
TCL PCBs - EPA 8082A (LVI) (WATER)

Holding Time: 7 days  
Container/Sample Preservation: 2 - Amber 120ml unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria
Aroclor 1016	12674-11-2	0.082824	0.0344148	ug/l	40-140	50	40-140	50	50	
Aroclor 1221	11104-28-2	0.082824	0.0664734	ug/l	40-140	50	40-140	50	50	
Aroclor 1232	11141-16-5	0.082824	0.0455532	ug/l	40-140	50	40-140	50	50	
Aroclor 1242	53469-21-9	0.082824	0.0387702	ug/l	40-140	50	40-140	50	50	
Aroclor 1248	12672-29-6	0.082824	0.048909	ug/l	40-140	50	40-140	50	50	
Aroclor 1254	11097-69-1	0.082824	0.0390558	ug/l	40-140	50	40-140	50	50	
Aroclor 1260	11096-82-5	0.082824	0.0320586	ug/l	40-140	50	40-140	50	50	
Aroclor 1262	37324-23-5	0.082824	0.0347718	ug/l	40-140	50	40-140	50	50	
Aroclor 1268	11100-14-4	0.082824	0.0334866	ug/l	40-140	50	40-140	50	50	
PCBs, Total	1336-36-3	0.082824	0.0320586	ug/l				50	50	
2,4,5,6-Tetrachloro-m-xylene	877-09-8									30-150
Decachlorobiphenyl	2051-24-3									30-150

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METALS by 6020B (WATER)

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria	Holding Time	Container/Sample Preservation
Aluminum, Total	7429-90-5	0.01	0.00327	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Antimony, Total	7440-36-0	0.004	0.000429	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Arsenic, Total	7440-38-2	0.0005	0.000165	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Barium, Total	7440-39-3	0.0005	0.000173	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Beryllium, Total	7440-41-7	0.0005	0.000107	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Cadmium, Total	7440-43-9	0.0002	0.0000599	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Calcium, Total	7440-70-2	0.1	0.0394	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Chromium, Total	7440-47-3	0.001	0.000178	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Cobalt, Total	7440-48-4	0.0005	0.000163	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Copper, Total	7440-50-8	0.001	0.000384	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Iron, Total	7439-89-6	0.05	0.0191	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Lead, Total	7439-92-1	0.001	0.000343	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Magnesium, Total	7439-95-4	0.07	0.0242	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Manganese, Total	7439-96-5	0.001	0.00044	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Nickel, Total	7440-02-0	0.002	0.000556	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Potassium, Total	7440-09-7	0.1	0.0309	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Selenium, Total	7782-49-2	0.005	0.00173	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Silver, Total	7440-22-4	0.0004	0.000163	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Sodium, Total	7440-23-5	0.1	0.0293	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Thallium, Total	7440-28-0	0.0005	0.000143	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Vanadium, Total	7440-62-2	0.005	0.00157	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Zinc, Total	7440-66-6	0.01	0.00341	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved

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 File: PM6658-1  
 Page: 1

**METALS by 7470A (WATER)**

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria	Holding Time	Container/Sample Preservation
Mercury, Total	7439-97-6	0.0002	0.0000915	mg/l	80-120		75-125	20	20		28 days	1 - Plastic 500ml HNO3 preserved

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 File: PM6658-1  
 Page: 1

**TCL Pesticides - EPA 8081B (WATER)**

Holding Time: 7 days  
 Container/Sample Preservation: 2 - Amber 120ml unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria
Delta-BHC	319-86-8	0.02	0.00467	ug/l	30-150	20	30-150	30	30	
Lindane	58-89-9	0.02	0.00434	ug/l	30-150	20	30-150	30	30	
Alpha-BHC	319-84-6	0.02	0.00439	ug/l	30-150	20	30-150	30	30	
Beta-BHC	319-85-7	0.02	0.0056	ug/l	30-150	20	30-150	30	30	
Heptachlor	76-44-8	0.02	0.0031	ug/l	30-150	20	30-150	30	30	
Aldrin	309-00-2	0.02	0.00216	ug/l	30-150	20	30-150	30	30	
Heptachlor epoxide	1024-57-3	0.02	0.00415	ug/l	30-150	20	30-150	30	30	
Endrin	72-20-8	0.04	0.00429	ug/l	30-150	20	30-150	30	30	
Endrin aldehyde	7421-93-4	0.04	0.0081	ug/l	30-150	20	30-150	30	30	
Endrin ketone	53494-70-5	0.04	0.00477	ug/l	30-150	20	30-150	30	30	
Dieldrin	60-57-1	0.04	0.00429	ug/l	30-150	20	30-150	30	30	
4,4'-DDE	72-55-9	0.04	0.00381	ug/l	30-150	20	30-150	30	30	
4,4'-DDD	72-54-8	0.04	0.00464	ug/l	30-150	20	30-150	30	30	
4,4'-DDT	50-29-3	0.04	0.00432	ug/l	30-150	20	30-150	30	30	
Endosulfan I	959-98-8	0.02	0.00345	ug/l	30-150	20	30-150	30	30	
Endosulfan II	33213-65-9	0.04	0.00519	ug/l	30-150	20	30-150	30	30	
Endosulfan sulfate	1031-07-8	0.04	0.00481	ug/l	30-150	20	30-150	30	30	
Methoxychlor	72-43-5	0.2	0.00684	ug/l	30-150	20	30-150	30	30	
Toxaphene	8001-35-2	0.2	0.0627	ug/l	30-150	20	30-150	30	30	
cis-Chlordane	5103-71-9	0.02	0.00666	ug/l	30-150	20	30-150	30	30	
trans-Chlordane	5103-74-2	0.02	0.00627	ug/l	30-150	20	30-150	30	30	
Chlordane	57-74-9	0.2	0.0463	ug/l	30-150	20	30-150	30	30	
2,4,5,6-Tetrachloro-m-xylene	877-09-8									30-150
Decachlorobiphenyl	2051-24-3									30-150

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Date Created: 05/16/19  
Created By: Tom Tanico  
File: PM6658-1  
Page: 1

NYTCL Semivolatiles -EPA 8270D-SIM (LVI) (WATER)

Holding Time: 7 days  
Container/Sample Preservation: 2 - Amber 250ml unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Acenaphthene	83-32-9	0.1001	0.01442168	ug/l	40-140	40	40-140	40	40			
2-Chloronaphthalene	91-58-7	0.2002	0.01804712	ug/l	40-140	40	40-140	40	40			
Fluoranthene	206-44-0	0.1001	0.02054052	ug/l	40-140	40	40-140	40	40			
Hexachlorobutadiene	87-68-3	0.5005	0.04674852	ug/l	40-140	40	40-140	40	40			
Naphthalene	91-20-3	0.1001	0.04882696	ug/l	40-140	40	40-140	40	40			
Benzo(a)anthracene	56-55-3	0.1001	0.0198198	ug/l	40-140	40	40-140	40	40			
Benzo(a)pyrene	50-32-8	0.1001	0.01493856	ug/l	40-140	40	40-140	40	40			
Benzo(b)fluoranthene	205-99-2	0.1001	0.01156792	ug/l	40-140	40	40-140	40	40			
Benzo(k)fluoranthene	207-08-9	0.1001	0.00889616	ug/l	40-140	40	40-140	40	40			
Chrysene	218-01-9	0.1001	0.01198288	ug/l	40-140	40	40-140	40	40			
Acenaphthylene	208-96-8	0.1001	0.01222676	ug/l	40-140	40	40-140	40	40			
Anthracene	120-12-7	0.1001	0.01450176	ug/l	40-140	40	40-140	40	40			
Benzo(ghi)perylene	191-24-2	0.1001	0.01365	ug/l	40-140	40	40-140	40	40			
Fluorene	86-73-7	0.1001	0.01456364	ug/l	40-140	40	40-140	40	40			
Phenanthrene	85-01-8	0.1001	0.02333604	ug/l	40-140	40	40-140	40	40			
Dibenzo(a,h)anthracene	53-70-3	0.1001	0.0127218	ug/l	40-140	40	40-140	40	40			
Indeno(1,2,3-cd)Pyrene	193-39-5	0.1001	0.01217216	ug/l	40-140	40	40-140	40	40			
Pyrene	129-00-0	0.1001	0.01902264	ug/l	40-140	40	40-140	40	40			
2-Methylnaphthalene	91-57-6	0.1001	0.02192372	ug/l	40-140	40	40-140	40	40			
Pentachlorophenol	87-86-5	0.8008	0.0143416	ug/l	40-140	40	40-140	40	40			
Hexachlorobenzene	118-74-1	0.8008	0.00938028	ug/l	40-140	40	40-140	40	40			
Hexachloroethane	67-72-1	0.8008	0.06320132	ug/l	40-140	40	40-140	40	40			
2-Fluorophenol	367-12-4										21-120	
Phenol-d6	13127-88-3										10-120	
Nitrobenzene-d5	4165-60-0										23-120	
2-Fluorobiphenyl	321-60-8										15-120	
2,4,6-Tribromophenol	118-79-6										10-120	
4-Terphenyl-d14	1718-51-0										41-149	

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 File: PM6658-1  
 Page: 1

NY PFAAs via EPA 537(M)-Isotope Dilution (WATER)

Holding Time: 14 days  
 Container/Sample Preservation: 1 - 2 Plastic/1 Plastic/1 H2O Plastic

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria
Perfluorobutanoic Acid (PFBA)	375-22-4	2	0.3732	ng/l	67-148	30	67-148	30	30	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	2	0.464	ng/l	63-161	30	63-161	30	30	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	2	0.38	ng/l	65-157	30	65-157	30	30	
Perfluorohexanoic Acid (PFHxA)	307-24-4	2	0.492	ng/l	69-168	30	69-168	30	30	
Perfluoroheptanoic Acid (PFHpA)	375-85-9	2	0.372	ng/l	58-159	30	58-159	30	30	
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	2	0.436	ng/l	69-177	30	69-177	30	30	
Perfluorooctanoic Acid (PFOA)	335-67-1	2	0.46	ng/l	63-159	30	63-159	30	30	
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	2	0.194	ng/l	49-187	30	49-187	30	30	
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	2	0.52	ng/l	61-179	30	61-179	30	30	
Perfluorononanoic Acid (PFNA)	375-95-1	2	0.436	ng/l	68-171	30	68-171	30	30	
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	2	0.56	ng/l	52-151	30	52-151	30	30	
Perfluorodecanoic Acid (PFDA)	335-76-2	2	0.62	ng/l	63-171	30	63-171	30	30	
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	2	0.2908	ng/l	56-173	30	56-173	30	30	
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSA)	2355-31-9	2	0.2504	ng/l	60-166	30	60-166	30	30	
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	2	0.424	ng/l	60-153	30	60-153	30	30	
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	2	0.386	ng/l	38-156	30	38-156	30	30	
Perfluorooctanesulfonamide (FOSA)	754-91-6	2	0.556	ng/l	46-170	30	46-170	30	30	
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	2	0.3728	ng/l	45-170	30	45-170	30	30	
Perfluorododecanoic Acid (PFDoA)	307-55-1	2	0.592	ng/l	67-153	30	67-153	30	30	
Perfluorotridecanoic Acid (PFTTrDA)	72629-94-8	2	0.314	ng/l	48-158	30	48-158	30	30	
Perfluorotetradecanoic Acid (PFTA)	376-06-7	2	0.988	ng/l	59-182	30	59-182	30	30	
PFOA/PFOS, Total		2	0.46	ng/l				30	30	
Perfluoro[13C4]Butanoic Acid (MPFBA)	NONE									2-156
Perfluoro[13C5]Pentanoic Acid (MSPPEA)	NONE									16-173
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	NONE									31-159
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	NONE									21-145
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	NONE									30-139
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	NONE									47-153
Perfluoro[13C8]Octanoic Acid (M8PFOA)	NONE									36-149
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6)	NONE									1-244
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	NONE									34-146
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	NONE									42-146
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	NONE									38-144
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8)	NONE									7-170
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid	NONE									1-181
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	NONE									40-144
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	NONE									1-87
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d)	NONE									23-146
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	NONE									24-161
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	NONE									33-143

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Created By: Tom Tanico  
File: PM6658-1  
Page: 1

WETCHEM (WATER)

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Method	Holding Time	Container/Sample Preservation
Chromium, Hexavalent	18540-29-9	0.01	0.003	mg/l	85-115	20	85-115	20	20	7196A	24 hours	1 - Plastic 500ml unpreserved
Cyanide, Total	57-12-5	0.005	0.0018	mg/l	85-115	20	80-120	20	20	9010C/9012B	14 days	1 - Plastic 250ml NaOH preserved

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Date Created: 05/16/19  
 Created By: Tom Tanico  
 File: PM6658-1  
 Page: 1

NYTCL Semivolatiles - EPA 8270D (LVI) (WATER)

Holding Time: 7 days  
 Container/Sample Preservation: 2 - Amber 250ml unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria
Acenaphthene	83-32-9	2.002	0.44408	ug/l	37-111	30	37-111	30	30	
1,2,4-Trichlorobenzene	120-82-1	5.0232	0.49868	ug/l	39-98	30	39-98	30	30	
Hexachlorobenzene	118-74-1	2.002	0.46592	ug/l	40-140	30	40-140	30	30	
Bis(2-chloroethyl)ether	111-44-4	2.002	0.50596	ug/l	40-140	30	40-140	30	30	
2-Chloronaphthalene	91-58-7	2.002	0.43316	ug/l	40-140	30	40-140	30	30	
1,2-Dichlorobenzene	95-50-1	2.002	0.455	ug/l	40-140	30	40-140	30	30	
1,3-Dichlorobenzene	541-73-1	2.002	0.40404	ug/l	40-140	30	40-140	30	30	
1,4-Dichlorobenzene	106-46-7	2.002	0.43316	ug/l	36-97	30	36-97	30	30	
3,3'-Dichlorobenzidine	91-94-1	5.0232	1.62344	ug/l	40-140	30	40-140	30	30	
2,4-Dinitrotoluene	121-14-2	5.0232	1.1648	ug/l	48-143	30	48-143	30	30	
2,6-Dinitrotoluene	606-20-2	5.0232	0.93184	ug/l	40-140	30	40-140	30	30	
Fluoranthene	206-44-0	2.002	0.257348	ug/l	40-140	30	40-140	30	30	
4-Chlorophenyl phenyl ether	7005-72-3	2.002	0.48776	ug/l	40-140	30	40-140	30	30	
4-Bromophenyl phenyl ether	101-55-3	2.002	0.37856	ug/l	40-140	30	40-140	30	30	
Bis(2-chloroisopropyl)ether	108-60-1	2.002	0.5278	ug/l	40-140	30	40-140	30	30	
Bis(2-chloroethoxy)methane	111-91-1	5.0232	0.50232	ug/l	40-140	30	40-140	30	30	
Hexachlorobutadiene	87-68-3	2.002	0.65884	ug/l	40-140	30	40-140	30	30	
Hexachlorocyclopentadiene	77-47-4	20.02	0.68796	ug/l	40-140	30	40-140	30	30	
Hexachloroethane	67-72-1	2.002	0.58604	ug/l	40-140	30	40-140	30	30	
Isophorone	78-59-1	5.0232	1.20484	ug/l	40-140	30	40-140	30	30	
Naphthalene	91-20-3	2.002	0.46592	ug/l	40-140	30	40-140	30	30	
Nitrobenzene	98-95-3	2.002	0.77168	ug/l	40-140	30	40-140	30	30	
NitrosoDiPhenylAmine(NDPA)/DPA	86-30-6	2.002	0.4186	ug/l	40-140	30	40-140	30	30	
n-Nitrosodi-n-propylamine	621-64-7	5.0232	0.64428	ug/l	29-132	30	29-132	30	30	
Bis(2-Ethylhexyl)phthalate	117-81-7	3.003	1.53608	ug/l	40-140	30	40-140	30	30	
Butyl benzyl phthalate	85-68-7	5.0232	1.17208	ug/l	40-140	30	40-140	30	30	
Di-n-butylphthalate	84-74-2	5.0232	0.38948	ug/l	40-140	30	40-140	30	30	
Di-n-octylphthalate	117-84-0	5.0232	1.274	ug/l	40-140	30	40-140	30	30	
Diethyl phthalate	84-66-2	5.0232	0.3822	ug/l	40-140	30	40-140	30	30	
Dimethyl phthalate	131-11-3	5.0232	1.82	ug/l	40-140	30	40-140	30	30	
Benzo(a)anthracene	56-55-3	2.002	0.32578	ug/l	40-140	30	40-140	30	30	
Benzo(a)pyrene	50-32-8	2.002	0.40768	ug/l	40-140	30	40-140	30	30	
Benzo(b)fluoranthene	205-99-2	2.002	0.355264	ug/l	40-140	30	40-140	30	30	
Benzo(k)fluoranthene	207-08-9	2.002	0.37492	ug/l	40-140	30	40-140	30	30	
Chrysene	218-01-9	2.002	0.341068	ug/l	40-140	30	40-140	30	30	
Acenaphthylene	208-96-8	2.002	0.46592	ug/l	45-123	30	45-123	30	30	
Anthracene	120-12-7	2.002	0.32942	ug/l	40-140	30	40-140	30	30	
Benzo(ghi)perylene	191-24-2	2.002	0.296296	ug/l	40-140	30	40-140	30	30	
Fluorene	86-73-7	2.002	0.41496	ug/l	40-140	30	40-140	30	30	
Phenanthrene	85-01-8	2.002	0.33124	ug/l	40-140	30	40-140	30	30	
Dibenzo(a,h)anthracene	53-70-3	2.002	0.323232	ug/l	40-140	30	40-140	30	30	
Indeno(1,2,3-cd)Pyrene	193-39-5	2.002	0.39676	ug/l	40-140	30	40-140	30	30	

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 Page: 2

NYTCL Semivolatiles - EPA 8270D (LVI) (WATER)

Holding Time: 7 days  
 Container/Sample Preservation: 2 - Amber 250ml unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria
Pyrene	129-00-0	2.002	0.279552	ug/l	26-127	30	26-127	30	30	
Biphenyl	92-52-4	2.002	0.45864	ug/l	40-140	30	40-140	30	30	
4-Chloroaniline	106-47-8	5.0232	1.07016	ug/l	40-140	30	40-140	30	30	
2-Nitroaniline	88-74-4	5.0232	0.49868	ug/l	52-143	30	52-143	30	30	
3-Nitroaniline	99-09-2	5.0232	0.81536	ug/l	25-145	30	25-145	30	30	
4-Nitroaniline	100-01-6	5.0232	0.8008	ug/l	51-143	30	51-143	30	30	
Dibenzofuran	132-64-9	2.002	0.49868	ug/l	40-140	30	40-140	30	30	
2-Methylnaphthalene	91-57-6	2.002	0.455	ug/l	40-140	30	40-140	30	30	
Acetophenone	98-86-2	5.0232	0.5278	ug/l	39-129	30	39-129	30	30	
2,4,6-Trichlorophenol	88-06-2	5.0232	0.61152	ug/l	30-130	30	30-130	30	30	
P-Chloro-M-Cresol	59-50-7	2.002	0.35126	ug/l	23-97	30	23-97	30	30	
2-Chlorophenol	95-57-8	2.002	0.48048	ug/l	27-123	30	27-123	30	30	
2,4-Dichlorophenol	120-83-2	5.0232	0.41132	ug/l	30-130	30	30-130	30	30	
2,4-Dimethylphenol	105-67-9	5.0232	1.77996	ug/l	30-130	30	30-130	30	30	
2-Nitrophenol	88-75-5	10.01	0.84812	ug/l	30-130	30	30-130	30	30	
4-Nitrophenol	100-02-7	10.01	0.6734	ug/l	10-80	30	10-80	30	30	
2,4-Dinitrophenol	51-28-5	20.02	6.6612	ug/l	20-130	30	20-130	30	30	
4,6-Dinitro-o-cresol	534-52-1	10.01	1.81636	ug/l	20-164	30	20-164	30	30	
Pentachlorophenol	87-86-5	10.01	1.79452	ug/l	9-103	30	9-103	30	30	
Phenol	108-95-2	5.0232	0.56784	ug/l	12-110	30	12-110	30	30	
2-Methylphenol	95-48-7	5.0232	0.4914	ug/l	30-130	30	30-130	30	30	
3-Methylphenol/4-Methylphenol	108-39-4/106-44-5	5.0232	0.48048	ug/l	30-130	30	30-130	30	30	
2,4,5-Trichlorophenol	95-95-4	5.0232	0.77532	ug/l	30-130	30	30-130	30	30	
Benzoic Acid	65-85-0	50.232	2.66084	ug/l	10-164	30	10-164	30	30	
Benzyl Alcohol	100-51-6	2.002	0.58968	ug/l	26-116	30	26-116	30	30	
Carbazole	86-74-8	2.002	0.4914	ug/l	55-144	30	55-144	30	30	
2-Fluorophenol	367-12-4									21-120
Phenol-d6	13127-88-3									10-120
Nitrobenzene-d5	4165-60-0									23-120
2-Fluorobiphenyl	321-60-8									15-120
2,4,6-Tribromophenol	118-79-6									10-120
4-Terphenyl-d14	1718-51-0									41-149

Please Note that the RL information provided in this table is calculated using a 100% Solids factor. (Soil/Solids only)  
 Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, Inc.



**Appendix F:**  
Alpha Analytical SOP for PFAS  
Analysis

## Determination of Selected Perfluorinated Alkyl Substances in Non-Potable Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS)

**Reference:** EPA Method 537, Version 1.1, September 2009, EPA Document #: EPA/600/R-08/092

EPA Method 537.1, Version 1, November 2018, EPA Document #: EPA/600/R-18/352

Department of Defense, Quality Systems Manual for Environmental Laboratories, Version 5.2, 2018

### 1. Scope and Application

**Matrices:** Non-potable water

**Definitions:** Refer to Alpha Analytical Quality Manual.

- 1.1 This is a liquid chromatography/tandem mass spectrometry (LC/MS/MS) method for the determination of selected perfluorinated alkyl substances (PFASs) in Non-potable Water. Accuracy and precision data have been generated in reagent water, and finished ground and surface waters for the compounds listed in Table 1.
- 1.2 The data report packages present the documentation of any method modification related to the samples tested. Depending upon the nature of the modification and the extent of intended use, the laboratory may be required to demonstrate that the modifications will produce equivalent results for the matrix. Approval of all method modifications is by one or more of the following laboratory personnel before performing the modification: Area Supervisor, Department Supervisor, Laboratory Director, or Quality Assurance Officer.
- 1.3 This method is restricted to use by or under the supervision of analysts experienced in the operation of the LC/MS/MS and in the interpretation of LC/MS/MS data. Each analyst must demonstrate the ability to generate acceptable results with this method by performing an initial demonstration of capability.

**Table 1**

Parameter	Acronym	CAS
Hexafluoropropylene oxide dimer acid <sup>1</sup>	HFPO-DA	13252-13-6
N-ethyl perfluorooctanesulfonamidoacetic acid	NEtFOSAA	2991-50-6
N-methyl perfluorooctanesulfonamidoacetic acid	NMeFOSAA	2355-31-9
Perfluorobutanesulfonic acid	PFBS	375-73-5
Perfluorodecanoic acid	PFDA	335-76-2
Perfluorododecanoic acid	PFDoA	307-55-1
Perfluoroheptanoic acid	PFHpA	375-85-9
Perfluorohexanesulfonic acid	PFHxS	355-46-4
Perfluorohexanoic acid	PFHxA	307-24-4



Table 1 (cont.)

Perfluorononanoic acid	PFNA	375-95-1
Perfluorooctanesulfonic acid	PFOS	1763-23-1
Perfluorooctanoic acid	PFOA	335-67-1
Perfluorotetradecanoic acid	PFTA	376-06-7
Perfluorotridecanoic acid	PFTTrDA	72629-94-8
Perfluoroundecanoic acid	PFUnA	2058-94-8
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OUdS	763051-92-9
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid	9Cl-PF3ONS	756426-58-1
4,8-dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4

## 2. Summary of Method

**2.1** A 250-mL water sample is fortified with surrogates and passed through a solid phase extraction (SPE) cartridge containing polystyrenedivinylbenzene (SDVB) to extract the method analytes and surrogates. The compounds are eluted from the solid phase with a small amount of methanol. The extract is concentrated to dryness with nitrogen in a heated water bath, and then adjusted to a 1-mL volume with 96:4% (vol/vol) methanol: water after adding the IS(s). A 3 $\mu$ L injection is made into an LC equipped with a C18 column that is interfaced to an MS/MS. The analytes are separated and identified by comparing the acquired mass spectra and retention times to reference spectra and retention times for calibration standards acquired under identical LC/MS/MS conditions. The concentration of each analyte is determined by using the internal standard technique. Surrogate analytes are added to all Field and QC Samples to monitor the extraction efficiency of the method analytes.

### 2.2 Method Modifications from Reference

**2.2.1** None.

## 3. Reporting Limits

**3.1** The reporting limit for PFAS's is 2 ng/L (4ng/L for HFPO-DA).

## 4. Interferences

**4.1** PFAS standards, extracts and samples should not come in contact with any glass containers or pipettes as these analytes can potentially adsorb to glass surfaces. PFAS analyte, IS and SUR standards commercially purchased in glass ampoules are acceptable; however, all subsequent transfers or dilutions performed by the analyst must be prepared and stored in polypropylene containers.

**4.2** Method interferences may be caused by contaminants in solvents, reagents (including reagent water), sample bottles and caps, and other sample processing hardware that lead to discrete artifacts and/or elevated baselines in the chromatograms. The method analytes in this method can also be found in many common laboratory supplies and equipment, such

as PTFE (polytetrafluoroethylene) products, LC solvent lines, methanol, aluminum foil, SPE sample transfer lines, etc. All items such as these must be routinely demonstrated to be free from interferences (less than 1/3 the RL for each method analyte) under the conditions of the analysis by analyzing laboratory reagent blanks as described in Section 9.2. **Subtracting blank values from sample results is not permitted.**

- 4.3 Matrix interferences may be caused by contaminants that are co-extracted from the sample. The extent of matrix interferences will vary considerably from source to source, depending upon the nature of the water. Humic and/or fulvic material can be co-extracted during SPE and high levels can cause enhancement and/or suppression in the electrospray ionization source or low recoveries on the SPE sorbent. Total organic carbon (TOC) is a good indicator of humic content of the sample. Under the LC conditions used during method development, matrix effects due to total organic carbon (TOC) were not observed.
- 4.4 Relatively large quantities of the preservative (Sect. 6.2.1) are added to sample bottles. The potential exists for trace-level organic contaminants in these reagents. Interferences from these sources should be monitored by analysis of laboratory reagent blanks (Sect. 9.2.1), particularly when new lots of reagents are acquired.
- 4.5 SPE cartridges can be a source of interferences. The analysis of field and laboratory reagent blanks can provide important information regarding the presence or absence of such interferences. Brands and lots of SPE devices should be tested to ensure that contamination does not preclude analyte identification and quantitation.

## 5. Health and Safety

- 5.1 The toxicity or carcinogenicity of each reagent and standard used in this method is not fully established; however, each chemical compound should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. A reference file of material safety data sheets is available to all personnel involved in the chemical analysis. Additional references to laboratory safety are available in the Chemical Hygiene Plan.
- 5.2 All personnel handling environmental samples known to contain or to have been in contact with municipal waste must follow safety practices for handling known disease causative agents.
- 5.3 PFOA has been described as "likely to be carcinogenic to humans." Pure standard materials and stock standard solutions of these method analytes should be handled with suitable protection to skin and eyes, and care should be taken not to breathe the vapors or ingest the materials.

## 6. Sample Collection, Preservation, Shipping and Handling

### 6.1 Sample Collection

- 6.1.1 Samples must be collected in three (3) 250-mL high density polyethylene (HDPE) container with an unlined plastic screw cap.
- 6.1.2 The sample handler must wash their hands before sampling and wear nitrile gloves while filling and sealing the sample bottles. PFAS contamination during sampling can occur from a number of common sources, such as food packaging

and certain foods and beverages. Proper hand washing and wearing nitrile gloves will aid in minimizing this type of accidental contamination of the samples.

- 6.1.3 Open the tap and allow the system to flush until the water temperature has stabilized (approximately 3 to 5 min). Collect samples from the flowing system.
- 6.1.4 Fill sample bottles, taking care not to flush out the sample preservation reagent. Samples do not need to be collected headspace free.
- 6.1.5 After collecting the sample, cap the bottle and agitate by hand until preservative is dissolved. Keep the sample sealed from time of collection until extraction.
- 6.1.6 Field Reagent Blank (FRB)
  - 6.1.6.1 A FRB must be handled along with each sample set. The sample set is composed of samples collected from the same sample site and at the same time. At the laboratory, fill the field blank sample bottle with reagent water and preservatives, seal, and ship to the sampling site along with the sample bottles. For each FRB shipped, an empty sample bottle (no preservatives) must also be shipped. At the sampling site, the sampler must open the shipped FRB and pour the preserved reagent water into the empty shipped sample bottle, seal and label this bottle as the FRB. The FRB is shipped back to the laboratory along with the samples and analyzed to ensure that PFASs were not introduced into the sample during sample collection/handling.
  - 6.1.6.2 The same batch of preservative must be used for the FRBs as for the field samples.
  - 6.1.6.3 The reagent water used for the FRBs must be initially analyzed for method analytes as a MB and must meet the MB criteria in Section 9.2.1 prior to use. This requirement will ensure samples are not being discarded due to contaminated reagent water rather than contamination during sampling.

## 6.2 Sample Preservation

- 6.2.1 The preservation reagent, listed in the table below, is added to each sample bottle as a solid prior to shipment to the field (or prior to sample collection).

Table 2

Compound	Amount	Purpose
Trizma	5.0 g/l	Buffering reagent and removes free chlorine

## 6.3 Sample Shipping

- 6.3.1 Samples must be chilled during shipment and must not exceed 10 °C during the first 48 hours after collection. Sample temperature must be confirmed to be at or below 10 °C when the samples are received at the laboratory. Samples stored in the lab must be held at or below 6 °C until extraction, but should not be frozen.

**NOTE:** Samples that are significantly above 10° C, at the time of collection, may need to be iced or refrigerated for a period of time, in order to chill them prior to shipping. This will allow them to be shipped with sufficient ice to meet the above requirements.

## 6.4 Sample Handling

### 6.4.1 Holding Times

**6.4.1.1** Water samples should be extracted as soon as possible but must be extracted within 14 days. Extracts must be stored at room temperature and analyzed within 28 days after extraction.

## 7. Equipment and Supplies

**7.1** SAMPLE CONTAINERS – 250-mL high density polyethylene (HDPE) bottles fitted with unlined screw caps. Sample bottles must be discarded after use.

**7.2** POLYPROPYLENE BOTTLES – 4-mL narrow-mouth polypropylene bottles.

**7.3** CENTRIFUGE TUBES – 15-mL conical polypropylene tubes with polypropylene screw caps for storing standard solutions and for collection of the extracts.

**7.4** AUTOSAMPLER VIALS – Polypropylene 0.7-mL autosampler vials with polypropylene caps.

**7.4.1** NOTE: Polypropylene vials and caps are necessary to prevent contamination of the sample from PTFE coated septa. However, polypropylene caps do not reseal, so evaporation occurs after injection. Thus, multiple injections from the same vial are not possible.

**7.5** POLYPROPYLENE GRADUATED CYLINDERS – Suggested sizes include 25, 50, 100 and 1000-mL cylinders.

**7.6** MICRO SYRINGES – Suggested sizes include 5, 10, 25, 50, 100, 250, 500 and 1000- $\mu$ L syringes.

**7.7** PLASTIC PIPETS – Polypropylene or polyethylene disposable pipets.

**7.8** ANALYTICAL BALANCE – Capable of weighing to the nearest 0.0001 g.

**7.9** SOLID PHASE EXTRACTION (SPE) APPARATUS FOR USING CARTRIDGES

**7.9.1** SPE CARTRIDGES – 0.5 g, 6-mL SPE cartridges containing styrenedivinylbenzene (SDVB) sorbent phase.

**7.9.2** VACUUM EXTRACTION MANIFOLD – A manual vacuum manifold with large volume sampler for cartridge extractions, or an automatic/robotic sample preparation system designed for use with SPE cartridges, may be used if all QC requirements discussed in Section 9 are met. Extraction and/or elution steps may not be changed or omitted to accommodate the use of an automated system. Care must be taken with automated SPE systems to ensure the PTFE commonly used in these systems does not contribute to unacceptable analyte concentrations in the MB (Sect. 9.2.1).

**7.9.3** SAMPLE DELIVERY SYSTEM – Use of a polypropylene transfer tube system, which transfers the sample directly from the sample container to the SPE cartridge, is recommended, but not mandatory. Standard extraction manifolds come equipped with PTFE transfer tube systems. These can be replaced with 1/8" O.D. x 1/16" I.D. polypropylene or polyethylene tubing cut to an appropriate length to ensure no sample contamination from the sample transfer lines. Other types of non-PTFE tubing may be used provided it meets the MB (Sect. 9.2.1)

and LCS (Sect. 9.3) QC requirements. The PTFE transfer tubes may be used, but an MB must be run on each PTFE transfer tube and the QC requirements in Section 13.2.2 must be met. In the case of automated SPE, the removal of PTFE lines may not be feasible; therefore, MBs will need to be rotated among the ports and must meet the QC requirements of Sections 13.2.2 and 9.2.1.

**7.10 EXTRACT CONCENTRATION SYSTEM** – Extracts are concentrated by evaporation with nitrogen using a water bath set no higher than 65 °C.

**7.11 LABORATORY OR ASPIRATOR VACUUM SYSTEM** – Sufficient capacity to maintain a vacuum of approximately 10 to 15 inches of mercury for extraction cartridges.

**7.12 LIQUID CHROMATOGRAPHY (LC)/TANDEM MASS SPECTROMETER (MS/MS) WITH DATA SYSTEM**

**7.12.1 LC SYSTEM** – Instrument capable of reproducibly injecting up to 10- $\mu$ L aliquots, and performing binary linear gradients at a constant flow rate near the flow rate used for development of this method (0.3 mL/min). The LC must be capable of pumping the water/methanol mobile phase without the use of a degasser which pulls vacuum on the mobile phase bottle (other types of degassers are acceptable). Degassers which pull vacuum on the mobile phase bottle will volatilize the ammonium acetate mobile phase causing the analyte peaks to shift to earlier retention times over the course of the analysis batch. The usage of a column heater is optional.

NOTE: During the course of method development, it was discovered that while idle for more than one day, PFASs built up in the PTFE solvent transfer lines. To prevent long delays in purging high levels of PFASs from the LC solvent lines, they were replaced with PEEK tubing and the PTFE solvent frits were replaced with stainless steel frits. It is not possible to remove all PFAS background contamination, but these measures help to minimize their background levels.

**7.12.2 LC/TANDEM MASS SPECTROMETER** – The LC/MS/MS must be capable of negative ion electrospray ionization (ESI) near the suggested LC flow rate of 0.3 mL/min. The system must be capable of performing MS/MS to produce unique product ions for the method analytes within specified retention time segments. A minimum of 10 scans across the chromatographic peak is required to ensure adequate precision.

**7.12.3 DATA SYSTEM** – An interfaced data system is required to acquire, store, reduce, and output mass spectral data. The computer software should have the capability of processing stored LC/MS/MS data by recognizing an LC peak within any given retention time window. The software must allow integration of the ion abundance of any specific ion within specified time or scan number limits. The software must be able to calculate relative response factors, construct linear regressions or quadratic calibration curves, and calculate analyte concentrations.

**7.12.4 ANALYTICAL COLUMN** – An LC C<sub>18</sub> column (2.1 x 150 mm) packed with 5  $\mu$ m d<sub>p</sub> C<sub>18</sub> solid phase particles was used. Any column that provides adequate resolution, peak shape, capacity, accuracy, and precision (Sect. 9) may be used.

## 8. Reagents and Standards

**8.1 GASES, REAGENTS, AND SOLVENTS** – Reagent grade or better chemicals should be used.

- 8.1.1** REAGENT WATER – Purified water which does not contain any measurable quantities of any method analytes or interfering compounds greater than 1/3 the RL for each method analyte of interest. Prior to daily use, at least 3 L of reagent water should be flushed from the purification system to rinse out any build-up of analytes in the system's tubing.
- 8.1.2** METHANOL (CH<sub>3</sub>OH, CAS#: 67-56-1) – High purity, demonstrated to be free of analytes and interferences.
- 8.1.3** AMMONIUM ACETATE (NH<sub>4</sub>C<sub>2</sub>H<sub>3</sub>O<sub>2</sub>, CAS#: 631-61-8) – High purity, demonstrated to be free of analytes and interferences.
- 8.1.4** 2 mM AMMONIUM ACETATE/REAGENT WATER – To prepare 1 L, add .154 g ammonium acetate to 1 L of reagent water. This solution is prone to volatility losses and should be replaced at least every 48 hours.
- 8.1.5** TRIZMA PRESET CRYSTALS, pH 7.0 – Reagent grade. A premixed blend of Tris [Tris(hydroxymethyl)aminomethane] and Tris HCL [Tris(hydroxymethyl)aminomethane hydrochloride]. Alternatively, a mix of the two components with a weight ratio of 15.5/1 Tris HCL/Tris may be used. These blends are targeted to produce a pH near 7.0 at 25 °C in reagent water. Trizma functions as a buffer, and removes free chlorine in chlorinated finished waters (Sect. 6.2.1).
- 8.1.6** NITROGEN – Used for the following purposes: Nitrogen aids in aerosol generation of the ESI liquid spray and is used as collision gas in some MS/MS instruments. The nitrogen used should meet or exceed instrument manufacturer's specifications. In addition, Nitrogen is used to concentrate sample extracts (Ultra High Purity or equivalent).
- 8.1.7** ARGON – Used as collision gas in MS/MS instruments. Argon should meet or exceed instrument manufacturer's specifications. Nitrogen gas may be used as the collision gas provided sufficient sensitivity (product ion formation) is achieved.
- 8.2** STANDARD SOLUTIONS – When a compound purity is assayed to be 96% or greater, the weight can be used without correction to calculate the concentration of the stock standard. PFAS analyte, IS and SUR standards commercially purchased in glass ampoules are acceptable; however, all subsequent transfers or dilutions performed by the analyst must be prepared and stored in polypropylene containers. Standards for sample fortification generally should be prepared in the smallest volume that can be accurately measured to minimize the addition of excess organic solvent to aqueous samples.
- NOTE:** Stock standards (Sect. 8.2.1, 8.2.3 and 8.2.5) are stored at ≤4 °C. Primary dilution standards (Sect. 8.2.2 and 8.2.4) are stored at room temperature to prevent adsorption of the method analytes onto the container surfaces that may occur when refrigerated. Storing the standards at room temperature will also minimize daily imprecision due to the potential of inadequate room temperature stabilization.
- 8.2.1** IS STOCK STANDARD SOLUTIONS - IS stock standard solutions are stable for at least 6 months when stored at 4 °C. The stock solution is purchased at a concentration range of 1-4 ng/μl.

**8.2.2** INTERNAL STANDARD PRIMARY DILUTION (IS PDS) STANDARD (0.5-2 ng/ $\mu$ L) – Prepare the IS PDS at a concentration of 0.5-2 ng/ $\mu$ L. The IS PDS is prepared in 96:4% (vol/vol) methanol:water. The IS PDS is stable for at least two months when stored in polypropylene centrifuge tubes at room temperature.

**Table 3**

Internal Standard	Conc. of IS Stock (ng/ $\mu$ L)	Vol. of IS Stock (mL)	Final Vol. of IS PDS (mL)	Final Conc. of IS PDS (ng/ $\mu$ L)
<sup>13</sup> C-PFOA	1	1.0	2.0	0.5
<sup>13</sup> C-PFOS	3	1.0	2.0	1.5
d <sub>3</sub> -NMeFOSAA	4	1.0	2.0	2.0

**8.2.3** SUR STOCK STANDARD SOLUTIONS – SUR stock standard solutions are stable for at least 6 months when stored at 4 °C.

**8.2.4** SURROGATE PRIMARY DILUTION STANDARD (SUR PDS) (0.5-2 ng/ $\mu$ L) – Prepare the SUR PDS at a concentration of 0.5-2 ng/ $\mu$ L. The SUR PDS is prepared in 96:4% (vol/vol) methanol:water. This solution is used to fortify all QC and Field Samples. The PDS is stable for one year when stored in polypropylene centrifuge tubes at room temperature.

**Table 4**

Surrogate	Conc. of SUR Stock (ng/ $\mu$ L)	Vol. of SUR Stock (mL)	Final Vol. of SUR PDS (L)	Final Conc. of SUR PDS (ng/ $\mu$ L)
<sup>13</sup> C-PFHxA	1.0	1.0	2.0	0.5
<sup>13</sup> C-PFDA	1.0	1.0	2.0	0.5
d <sub>5</sub> -NEtFOSAA	4.0	1.0	2.0	2.0
Tetrafluoro-2-heptafluoropropoxy- <sup>13</sup> C <sub>3</sub> -propanoic acid <sup>1</sup>	50	1.0	2.0	0.5

<sup>1</sup> EPA 537.1 Surrogate only

**8.2.5** ANALYTE STOCK STANDARD SOLUTION – Analyte stock standards are stable for at least 6 months when stored at -15 °C. When using these stock standards to prepare a PDS, care must be taken to ensure that these standards are at room temperature and adequately vortexed.

**Table 5**

Analyte	Analyte Stock Solvent	Concentration (ug/mL)
PFHxA	100% methanol	1.0
PFHpA	100% methanol	1.0
PFOA	100% methanol	1.0
PFNA	100% methanol	1.0
PFDA	100% methanol	1.0
PFUnA	100% methanol	1.0
PFDoA	100% methanol	1.0
PFTTrDA	100% methanol	1.0
PFTA	100% methanol	1.0
PFBS	100% methanol	1.0

Table 5 (cont.)

Analyte	Analyte Stock Solvent	Concentration (ug/mL)
PFHxS	100% methanol	1.0
PFOS	100% methanol	1.0
NEtFOSAA	100% methanol	1.0
NMeFOSAA	100% methanol	1.0
HFPO-DA	100% methanol	50.0
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	100% methanol	50.0
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid	100% methanol	50.0
4,8-dioxa-3H-perfluorononanoic acid	100% methanol	50.0

**8.2.6** LOW, MEDIUM AND HIGH LEVEL LCS – The LCS’s will be prepared at the following concentrations and rotated per batch; 2 ng/L, 40 ng/L, 500 ng/l. The analyte PDS contains all the method analytes of interest at various concentrations in methanol containing 4% water. The analyte PDS has been shown to be stable for 6 months when stored at room temperature.

**8.2.7** CALIBRATION STANDARDS (CAL) –

Current Concentrations (ng/mL): 0.5, 1.0, 5.0, 10.0, 50.0, 125 and 150 (optional)

Prepare the CAL standards over the concentration range of interest from dilutions of the analyte PDS in methanol containing 4% reagent water. The IS and SUR are added to the CAL standards at a constant concentration (10-40 ng/L). The lowest concentration CAL standard must be at or below the RL (2 ng/L), which may depend on system sensitivity. The CAL standards may also be used as CCVs (Sect. 9.9). The CAL standards are stable for at least two weeks when stored at room temperature. Longer storage times are acceptable provided appropriate QC measures are documented demonstrating the CAL standard stability.

## 9. Quality Control

The laboratory must maintain records to document the quality of data that is generated. Ongoing data quality checks are compared with established performance criteria to determine if the results of analyses meet the performance characteristics of the method.

### 9.1 REPORTING LIMIT (RL) CONFIRMATION

**9.1.1** Fortify, extract, and analyze seven replicate LCSs at 2 ng/l. These LCSs must contain all method preservatives described in Section 6.2.1. Calculate the mean measured concentration (*Mean*) and standard deviation for these replicates. Determine the Half Range for the prediction interval of results ( $HR_{PIR}$ ) using the equation below

$$HR_{PIR} = 3.963s$$

Where:

*s* = the standard deviation

3.963 = a constant value for seven replicates.



- 9.1.2 Confirm that the upper and lower limits for the Prediction Interval of Result ( $PIR = Mean \pm HR_{PIR}$ ) meet the upper and lower recovery limits as shown below

The Upper PIR Limit must be  $\leq 150\%$  recovery.

$$\frac{Mean + HR_{PIR}}{Fortified\ Concentration} \times 100\% \leq 150\%$$

The Lower PIR Limit must be  $\geq 50\%$  recovery.

$$\frac{Mean - HR_{PIR}}{Fortified\ Concentration} \times 100\% \geq 50\%$$

- 9.1.3 The RL is validated if both the Upper and Lower PIR Limits meet the criteria described above. If these criteria are not met, the RL has been set too low and must be determined again at a higher concentration.

## 9.2 Blank(s)

- 9.2.1 **METHOD BLANK (MB)** - A Method Blank (MB) is required with each extraction batch to confirm that potential background contaminants are not interfering with the identification or quantitation of method analytes. If more than 20 Field Samples are included in a batch, analyze an MB for every 20 samples. If the MB produces a peak within the retention time window of any analyte that would prevent the determination of that analyte, determine the source of contamination and eliminate the interference before processing samples. Background contamination must be reduced to an acceptable level before proceeding. Background from method analytes or other contaminants that interfere with the measurement of method analytes must be below 1/3 of the RL. Blank contamination is estimated by extrapolation, if the concentration is below the lowest CAL standard. This extrapolation procedure is not allowed for sample results as it may not meet data quality objectives. If the method analytes are detected in the MB at concentrations equal to or greater than this level, then all data for the problem analyte(s) must be considered invalid for all samples in the extraction batch. Because background contamination is a significant problem for several method analytes, it is highly recommended that the analyst maintain a historical record of MB data.
- 9.2.2 **FIELD REAGENT BLANK (FRB)** - The purpose of the FRB is to ensure that PFASs measured in the Field Samples were not inadvertently introduced into the sample during sample collection/handling. Analysis of the FRB is required only if a Field Sample contains a method analyte or analytes at or above the RL. The FRB is processed, extracted and analyzed in exactly the same manner as a Field Sample. If the method analyte(s) found in the Field Sample is present in the FRB at a concentration greater than 1/3 the RL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed.

### 9.3 Laboratory Control Sample (LCS)

- 9.3.1 An LCS is required with each extraction batch. The fortified concentration of the LCS must be rotated between low, medium, and high concentrations from batch to batch.
- 9.3.2 The low concentration LCS must be as near as practical to, but no more than two times, the RL. Similarly, the high concentration LCS should be near the high end of the calibration range established during the initial calibration (Sect. 10.6).
- 9.3.3 Results of the low-level LCS analyses must be 50-150% of the true value. Results of the medium and high-level LCS analyses must be 70-130% of the true value. If the LCS results do not meet these criteria for method analytes, then all data for the problem analyte(s) must be considered invalid for all samples in the extraction batch.
- 9.3.4 It is the responsibility of the extraction chemist to view the previous extraction batch to determine the next spiking concentration. (Low → Medium → High)

### 9.4 Internal Standards (IS)

The analyst must monitor the peak areas of the IS(s) in all injections during each analysis day. The IS responses (peak areas) in any chromatographic run must be within 70-140% of the response in the most recent CCV and must not deviate by more than 50% from the average area measured during initial analyte calibration. If the IS areas in a chromatographic run do not meet these criteria, inject a second aliquot of that extract aliquoted into a new capped autosampler vial. Random evaporation losses have been observed with the polypropylene caps causing high IS(s) areas.

- 9.4.1 If the reinjected aliquot produces an acceptable IS response, report results for that aliquot.
- 9.4.2 If the reinjected extract fails again, the analyst should check the calibration by reanalyzing the most recently acceptable CAL standard. If the CAL standard fails the criteria of Section 9.9, recalibration is in order per Section 10.6. If the CAL standard is acceptable, extraction of the sample may need to be repeated provided the sample is still within the holding time. Otherwise, report results obtained from the reinjected extract, but annotate as suspect. Alternatively, collect a new sample and re-analyze.

### 9.5 Surrogate Recovery

The SUR standard is fortified into all samples, CCVs, MBs, LCSs, MSs, MSDs, FD, and FRB prior to extraction. It is also added to the CAL standards. The SUR is a means of assessing method performance from extraction to final chromatographic measurement. Calculate the recovery (%R) for the SUR using the following equation

$$\%R = (A / B) \times 100$$

Where:

- A = calculated SUR concentration for the QC or Field Sample  
B = fortified concentration of the SUR.

**9.5.1.1** SUR recovery must be in the range of 70-130%. When SUR recovery from a sample, blank, or CCV is less than 70% or greater than 130%, check 1) calculations to locate possible errors, 2) standard solutions for degradation, 3) contamination, and 4) instrument performance. Correct the problem and reanalyze the extract.

**9.5.1.2** If the extract reanalysis meets the SUR recovery criterion, report only data for the reanalyzed extract.

**9.5.1.3** If the extract reanalysis fails the 70-130% recovery criterion, the analyst should check the calibration by injecting the last CAL standard that passed. If the CAL standard fails the criteria of Section 10.7, recalibration is in order per Section 10.6. If the CAL standard is acceptable, extraction of the sample should be repeated provided the sample is still within the holding time. If the re-extracted sample also fails the recovery criterion, report all data for that sample as suspect/SUR recovery to inform the data user that the results are suspect due to SUR recovery. Alternatively, collect a new sample and re-analyze.

## 9.6 Matrix Spike (MS)

**9.6.1** Analysis of an MS is required in each extraction batch and is used to determine that the sample matrix does not adversely affect method accuracy. Assessment of method precision is accomplished by analysis of a Field Duplicate (FD) (Sect. 9.7); however, infrequent occurrence of method analytes would hinder this assessment. If the occurrence of method analytes in the samples is infrequent, or if historical trends are unavailable, a second MS, or MSD, must be prepared, extracted, and analyzed from a duplicate of the Field Sample. Extraction batches that contain MSDs will not require the extraction of a field sample duplicate. If a variety of different sample matrices are analyzed regularly, for example, groundwater and surface water sources, method performance should be established for each. Over time, MS data should be documented by the laboratory for all routine sample sources.

**9.6.2** Within each extraction batch, a minimum of one Field Sample is fortified as an MS for every 20 Field Samples analyzed. The MS is prepared by spiking a sample with an appropriate amount of the Analyte Stock Standard (Sect. 8.2.5). Use historical data and rotate through the low, mid and high concentrations when selecting a fortifying concentration. Calculate the percent recovery (%R) for each analyte using the equation

$$\%R = \frac{(A - B)}{C} \times 100$$

Where:

A = measured concentration in the fortified sample  
B = measured concentration in the unfortified sample  
C = fortification concentration.

**9.6.3** Analyte recoveries may exhibit matrix bias. For samples fortified at or above their native concentration, recoveries should range between 70-130%, except for low-level fortification near or at the RL (within a factor of 2-times the RL concentration) where 50-150% recoveries are acceptable. If the accuracy of any analyte falls outside the designated range, and the laboratory performance for

that analyte is shown to be in control in the CCVs, the recovery is judged to be matrix biased. The result for that analyte in the unfortified sample is labeled suspect/matrix to inform the data user that the results are suspect due to matrix effects.

## 9.7 Laboratory Duplicate

**9.7.1** FIELD DUPLICATE OR LABORATORY FORTIFIED SAMPLE MATRIX DUPLICATE (FD or MSD) – Within each extraction batch (not to exceed 20 Field Samples), a minimum of one FD or MSD must be analyzed. Duplicates check the precision associated with sample collection, preservation, storage, and laboratory procedures. If method analytes are not routinely observed in Field Samples, an MSD should be analyzed rather than an FD.

**9.7.2** Calculate the relative percent difference (RPD) for duplicate measurements (FD1 and FD2) using the equation

$$RPD = \frac{|FD1 - FD2|}{(FD1 + FD2) / 2} \times 100$$

**9.7.3** RPDs for FDs should be  $\leq 30\%$ . Greater variability may be observed when FDs have analyte concentrations that are within a factor of 2 of the RL. At these concentrations, FDs should have RPDs that are  $\leq 50\%$ . If the RPD of any analyte falls outside the designated range, and the laboratory performance for that analyte is shown to be in control in the CCV, the recovery is judged to be matrix biased. The result for that analyte in the unfortified sample is labeled suspect/matrix to inform the data user that the results are suspect due to matrix effects.

**9.7.4** If an MSD is analyzed instead of a FD, calculate the relative percent difference (RPD) for duplicate MSs (MS and MSD) using the equation

$$RPD = \frac{|MS - MSD|}{(MS + MSD) / 2} \times 100$$

**9.7.5** RPDs for duplicate MSs should be  $\leq 30\%$  for samples fortified at or above their native concentration. Greater variability may be observed when MSs are fortified at analyte concentrations that are within a factor of 2 of the RL. MSs fortified at these concentrations should have RPDs that are  $\leq 50\%$  for samples fortified at or above their native concentration. If the RPD of any analyte falls outside the designated range, and the laboratory performance for that analyte is shown to be in control in the CCV, the recovery is judged to be matrix biased. The result for that analyte in the unfortified sample is labeled suspect/matrix to inform the data user that the results are suspect due to matrix effects.

## 9.8 Initial Calibration Verification (ICV)

**9.8.1** As part of the IDC (Sect. 13.2), each time a new Analyte Stock Standard solution (Sect. 8.2.5) is used, and at least quarterly, analyze a QCS sample from a source different from the source of the CAL standards. If a second vendor is not available, then a different lot of the standard should be used. The QCS should be prepared and analyzed just like a CCV. Acceptance criteria for the QCS are identical to the CCVs; the calculated amount for each analyte must be  $\pm 30\%$  of the expected value. If measured analyte concentrations are not of acceptable

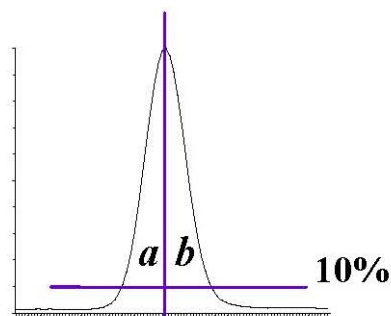
accuracy, check the entire analytical procedure to locate and correct the problem.

## 9.9 Continuing Calibration Verification (CCV)

9.9.1 CCV Standards are analyzed at the beginning of each analysis batch, after every 10 Field Samples, and at the end of the analysis batch. See Section 10.7 for concentration requirements and acceptance criteria.

## 9.10 Method-specific Quality Control Samples

9.10.1 PEAK ASYMMETRY FACTOR – A peak asymmetry factor must be calculated using the equation below during the IDL and every time a calibration curve is generated. The peak asymmetry factor for the first two eluting peaks in a midlevel CAL standard (if only two analytes are being analyzed, both must be evaluated) must fall in the range of 0.8 to 1.5. Modifying the standard or extract composition to more aqueous content to prevent poor shape is not permitted. See guidance in Section 10.6.4.1 if the calculated peak asymmetry factors do not meet the criteria.



$$A_s = b / a$$

Where:

$A_s$  = peak asymmetry factor

$b$  = width of the back half of the peak measured (at 10% peak height) from the trailing edge of the peak to a line dropped perpendicularly from the peak apex

$a$  = the width of the front half of the peak measured (at 10% peak height) from the leading edge of the peak to a line dropped perpendicularly from the apex.

## 9.11 Method Sequence

ICV  
CCV-LOW  
MB  
LCS  
LCSD  
MS  
Duplicate or MSD  
Field Samples (1-10)  
CCV-MID  
Field Samples (11-20)  
CCV-HIGH

## 10. Procedure

### 10.1 Equipment Set-up

- 10.1.1** This procedure may be performed manually or in an automated mode using a robotic or automatic sample preparation device. If an automated system is used to prepare samples, follow the manufacturer's operating instructions, but all extraction and elution steps must be the same as in the manual procedure. Extraction and/or elution steps may not be changed or omitted to accommodate the use of an automated system. If an automated system is used, the MBs should be rotated among the ports to ensure that all the valves and tubing meet the MB requirements (Sect. 9.2).
- 10.1.2** Some of the PFASs adsorb to surfaces, including polypropylene. Therefore, the aqueous sample bottles must be rinsed with the elution solvent (Sect 10.3.4) whether extractions are performed manually or by automation. The bottle rinse is passed through the cartridge to elute the method analytes and is then collected (Sect. 10.3.4).
- 10.1.3 NOTE:** The SPE cartridges and sample bottles described in this section are designed as single use items and should be discarded after use. They may not be refurbished for reuse in subsequent analyses.

### 10.2 Sample Preparation

- 10.2.1** Samples are preserved, collected and stored as presented in Section 6. All Field and QC Samples, including the MB, LCS and FRB, must contain the dechlorinating agent listed in Section 6.2.1. Determine sample volume. An indirect measurement may be done in one of two ways: by marking the level of the sample on the bottle or by weighing the sample and bottle to the nearest 10 g. After extraction, proceed to Section 10.5 for final volume determination. Some of the PFASs adsorb to surfaces, thus the sample volume may **NOT** be transferred to a graduated cylinder for volume measurement. The MB, LCS and FRB may be prepared by measuring 250 mL of reagent water with a polypropylene graduated cylinder or filling a 250-mL sample bottle to near the top.

The entire sample that is received must be sent through the SPE cartridge. In addition, the bottle must be solvent rinsed and this rinse must be sent through the SPE cartridge as well. The method blank (MB) and laboratory control sample (LCS) must be extracted in exactly the same manner (i.e., must include the bottle solvent rinse). It should be noted that a water rinse alone is not sufficient. This does not apply to samples with high concentrations of PFAS that are prepared using serial dilution and not SPE.

- 10.2.2** Add 20  $\mu\text{L}$  of the SUR PDS (Sect. 8.2.4) to each sample, cap and invert to mix for a final concentration of 10 ng/L for  $^{13}\text{C}$ -PFHxA and  $^{13}\text{C}$ -PFDA and 40 ng/L for  $\text{d}_5$ -NEtFOSAA.
- 10.2.3** In addition to the SUR(s) and dechlorination agent, if the sample is an LCS, MS, or MSD, add the necessary amount of analyte PDS (Sect. 8.2.5). Cap and invert each sample to mix.

### 10.3 Cartridge SPE Procedure

- 10.3.1** CARTRIDGE CLEAN-UP AND CONDITIONING – DO NOT allow cartridge packing material to go dry during any of the conditioning steps. Rinse each cartridge with 15 mL of methanol. Next, rinse each cartridge with 18 mL of reagent water, without allowing the water to drop below the top edge of the packing. If the cartridge goes dry during the conditioning phase, the conditioning must be started over. Add 4-5 mL of reagent water to each cartridge, attach the sample transfer tubes (Sect. 7.2.3), turn on the vacuum, and begin adding sample to the cartridge.
- 10.3.2** SAMPLE EXTRACTON – Adjust the vacuum so that the approximate flow rate is 10-15 mL/min. Do not allow the cartridge to go dry before all the sample has passed through.
- 10.3.3** SAMPLE BOTTLE AND CARTRIDGE RINSE – After the entire sample has passed through the cartridge, rinse the sample bottles with two 7.5-mL aliquots of reagent water and draw each aliquot through the sample transfer tubes and the cartridges. Draw air or nitrogen through the cartridge for 5 min at high vacuum (10-15 in. Hg).

**NOTE: If empty plastic reservoirs are used in place of the sample transfer tubes to pass the samples through the cartridges, these reservoirs must be treated like the transfer tubes. After the entire sample has passed through the cartridge, the reservoirs must be rinsed to waste with reagent water.**

- 10.3.4** SAMPLE BOTTLE AND CARTRIDGE ELUTION – Turn off and release the vacuum. Lift the extraction manifold top and insert a rack with collection tubes into the extraction tank to collect the extracts as they are eluted from the cartridges. Rinse the sample bottles with 4 mL of methanol and elute the analytes from the cartridges by pulling the 4 mL of methanol through the sample transfer tubes and the cartridges. Use a low vacuum such that the solvent exits the cartridge in a dropwise fashion. Repeat sample bottle rinse and cartridge elution with a second 4-mL aliquot of methanol.

**NOTE: If empty plastic reservoirs are used in place of the sample transfer tubes to pass the samples through the cartridges, these reservoirs must be treated like the transfer tubes. After the reservoirs have been rinsed in Section 10.3.3, the elution solvent used to rinse the sample bottles must be swirled down the sides of the reservoirs while eluting the cartridge to ensure that any method analytes on the surface of the reservoirs are transferred to the extract.**

### 10.4 Extract Concentration

- 10.4.1** Concentrate the extract to dryness under a gentle stream of nitrogen in a heated water bath (60-65 °C) to remove all the water/methanol mix. Add the appropriate amount of 96:4% (vol/vol) methanol:water solution and the IS PDS (Sect. 8.2.2) to the collection vial to bring the volume to 1 mL and vortex. Transfer a small aliquot with a plastic pipet (Sect. 7.6) to a polypropylene autosampler vial.

**NOTE: It is recommend that the entire 1-mL aliquot not be transferred to the autosampler vial because the polypropylene autosampler caps do not reseal after injection. Therefore, do not store the extracts in the autosampler vials as evaporation losses can occur occasionally in these**

autosampler vials. Extracts can be stored in 15-mL centrifuge tubes (Sect. 7.3).

## 10.5 Sample Volume Determination

**10.5.1** If the level of the sample was marked on the sample bottle, use a graduated cylinder to measure the volume of water required to fill the original sample bottle to the mark made prior to extraction. Determine to the nearest 10 mL. If using weight to determine volume, weigh the empty bottle to the nearest 10 g and determine the sample weight by subtraction of the empty bottle weight from the original sample weight (Sect. 10.2.1). Assume a sample density of 1.0 g/mL. In either case, the sample volume will be used in the final calculations of the analyte concentration (Sect. 11.2).

**10.6 Initial Calibration** - Demonstration and documentation of acceptable initial calibration is required before any samples are analyzed. After the initial calibration is successful, a CCV is required at the beginning and end of each period in which analyses are performed, and after every tenth Field Sample.

### 10.6.1 ESI-MS/MS TUNE

**10.6.1.1** Calibrate the mass scale of the MS with the calibration compounds and procedures prescribed by the manufacturer.

**10.6.1.2** Optimize the [M-H]<sup>-</sup> for each method analyte by infusing approximately 0.5-1.0 µg/mL of each analyte (prepared in the initial mobile phase conditions) directly into the MS at the chosen LC mobile phase flow rate (approximately 0.3 mL/min). This tune can be done on a mix of the method analytes. The MS parameters (voltages, temperatures, gas flows, etc.) are varied until optimal analyte responses are determined. The method analytes may have different optima requiring some compromise between the optima.

**10.6.1.3** Optimize the product ion for each analyte by infusing approximately 0.5-1.0 µg/mL of each analyte (prepared in the initial mobile phase conditions) directly into the MS at the chosen LC mobile phase flow rate (approximately 0.4 mL/min). This tune can be done on a mix of the method analytes. The MS/MS parameters (collision gas pressure, collision energy, etc.) are varied until optimal analyte responses are determined. Typically, the carboxylic acids have very similar MS/MS conditions and the sulfonic acids have similar MS/MS conditions.

**10.6.2** Establish LC operating parameters that optimize resolution and peak shape. Modifying the standard or extract composition to more aqueous content to prevent poor shape is not permitted.

**Cautions: LC system components, as well as the mobile phase constituents, contain many of the method analytes in this method. Thus, these PFASs will build up on the head of the LC column during mobile phase equilibration. To minimize the background PFAS peaks and to keep background levels constant, the time the LC column sits at initial conditions must be kept constant and as short as possible (while ensuring reproducible retention times). In addition, prior to daily use, flush the column with 100% methanol for at least 20 min before initiating a sequence. It may be necessary on some systems to flush other LC components such as wash**



syringes, sample needles or any other system components before daily use.

Mobile phase modifiers other than 20 mM ammonium acetate may be used at the discretion of the analyst, provided that the retention time stability criteria in Sect. 10.9.2 can be met over a period of two weeks. During method development, retention times shifted to shorter and shorter times as days progressed when mobile phases with less than 20 mM ammonium acetate were used.

**10.6.3** Inject a mid-level CAL standard under LC/MS conditions to obtain the retention times of each method analyte. If analyzing for PFTA, ensure that the LC conditions are adequate to prevent co-elution of PFTA and the mobile phase interferants. These interferants have the same precursor and products ions as PFTA, and under faster LC conditions may co-elute with PFTA. Divide the chromatogram into retention time windows each of which contains one or more chromatographic peaks. During MS/MS analysis, fragment a small number of selected precursor ions ([M-H]<sup>-</sup>) for the analytes in each window and choose the most abundant product ion. For maximum sensitivity, small mass windows of ±0.5 daltons around the product ion mass were used for quantitation. If sufficient sensitivity exists to meet the RL, wider mass ranges may be used to obtain more confirmation ions.

**10.6.3.1** As recommended by the EPA Advisory on September 2016, both linear and branched isomers should be included in the quantitation. **NOTE:** As the NOTE in Section 10.6.4.1 indicates, PFOS has linear and branched isomers. There have been reports that not all the products ions in the linear PFOS are produced in all the branched PFOS isomers. (This phenomenon probably exists for PFHxS and PFBS also, although it has not been studied to date.) Thus, in an attempt to reduce PFOS bias, it is required that the  $m/z$  499 →  $m/z$  80 transition be used as the quantitation transition. Some MS/MS instruments, such as conventional ion traps, may not be able to scan a product ion with such a wide mass difference from the precursor ion; therefore, they may not be used for this method if PFOS, PFBS, or PFHxS analysis is to be conducted. Literature reports indicate for the most abundant PFOS isomer, which is the linear isomer, that all the products ions obtained on an ion trap have less than 10% relative abundance. In addition, there is not a single ion trap MS/MS transition that encompasses the linear isomer and the majority of the branch isomers; thus, the bias would be unacceptably high.

**10.6.4** Inject a mid-level CAL standard under optimized LC/MS/MS conditions to ensure that each method analyte is observed in its MS/MS window and that there are at least 10 scans across the peak for optimum precision.

**10.6.4.1** If broad, split or fronting peaks are observed for the first two eluting chromatographic peaks (if only two analytes are being analyzed, both must be evaluated), change the initial mobile phase conditions to higher aqueous content until the peak asymmetry ratio for each peak is 0.8 – 1.5. The peak asymmetry factor is calculated as described in Section 9.10.1 on a mid-level CAL standard. The peak asymmetry factor must meet the above criteria for the first two eluting peaks during the IDL and every time a new calibration curve is generated. Modifying the standard

or extract composition to more aqueous content to prevent poor shape is not permitted.

**NOTE: PFHxS, PFOS, NMeFOSAA, and NEtFOSAA have multiple chromatographic peaks using the LC conditions in Table 5 due to chromatographic resolution of the linear and branched isomers of these compounds. According to the EPA Advisory, September 2016, the branched isomers are identified by analyzing a qualitative/semi-qualitative mixed PFOA standard and the quantitation of PFOA is accomplished by integration the total response which includes peaks identified as linear and branched isomers. Most PFASs are produced by two different processes. One process gives rise to linear PFASs only while the other process produces both linear and branched isomers. Thus, both branched and linear PFASs can potentially be found in the environment. For the aforementioned compounds that give rise to more than one peak, all the chromatographic peaks observed in the standard must be integrated and the areas totaled. Chromatographic peaks in a sample must be integrated in the same way as the CAL standard.**

**10.6.5** Prepare a set of CAL standards as described in Section 8.2.7. The lowest concentration CAL standard must be at or below the RL (2 ng/L), which may depend on system sensitivity. It is recommended that at least four of the CAL standards are at a concentration greater than or equal to the RL.

**10.6.6** The LC/MS/MS system is calibrated using the IS technique. Use the LC/MS/MS data system software to generate a linear regression or quadratic calibration curve for each of the analytes. This curve **must always** be forced through zero and may be concentration weighted, if necessary. Forcing zero allows for a better estimate of the background levels of method analytes.

**10.6.6.1** The isotopically labeled IS(s) in this method may undergo suppression in the ESI source if the concentration of the co-eluting unlabeled method analyte(s) is too high. The analyte concentration at which suppression may occur can vary depending on the instrument, LC conditions, ESI conditions, IS concentration, etc. To evaluate whether suppression is occurring during calibration, calculate the relative percent difference (RPD) between the high (H) and low (L) areas for each IS using the equation

$$RPD = \frac{(H - L)}{(H + L) / 2} \times 100$$

**10.6.6.2** The RPD calculated above must be <20% for each IS during calibration. If the calculated RPD is >20% for any IS, the analyst must recalibrate at lower analyte concentrations until the IS RPDs are <20%.

**10.6.7** CALIBRATION ACCEPTANCE CRITERIA – When quantitated using the initial calibration curve, each calibration point, except the lowest point, for each analyte should calculate to be within 70-130% of its true value. The lowest CAL point should calculate to be within 50-150% of its true value. If these criteria cannot be met, the analyst will have difficulty meeting ongoing QC criteria. It is recommended that corrective action is taken to reanalyze the CAL standards, restrict the range of calibration, or select an alternate method of calibration (forcing the curve through zero is still required).

**10.6.7.1 CAUTION:** When acquiring MS/MS data, LC operating conditions must be carefully reproduced for each analysis to provide reproducible retention times. If this is not done, the correct ions will not be monitored at the appropriate times. As a precautionary measure, the chromatographic peaks in each window must not elute too close to the edge of the segment time window.

**10.7 CONTINUING CALIBRATION CHECK (CCV)** – Minimum daily calibration verification is as follows. Verify the initial calibration at the beginning and end of each group of analyses, and after every tenth sample during analyses. In this context, a “sample” is considered to be a Field Sample. MBs, CCVs, LCSs, MSs, FDs FRBs and MSDs are not counted as samples. The beginning CCV of each analysis batch must be at or below the RL in order to verify instrument sensitivity prior to any analyses. If standards have been prepared such that all low CAL points are not in the same CAL solution, it may be necessary to analyze two CAL standards to meet this requirement. Alternatively, the analyte concentrations in the analyte PDS may be customized to meet this criterion. Subsequent CCVs should alternate between a medium and high concentration CAL standard.

**10.7.1** Inject an aliquot of the appropriate concentration CAL standard and analyze with the same conditions used during the initial calibration.

**10.7.2** Determine that the absolute areas of the quantitation ions of the IS(s) are within 70-140% of the areas measured in the most recent continuing calibration check, and within 50-150% from the average areas measured during initial calibration. If any of the IS areas has changed by more than these amounts, adjustments must be made to restore system sensitivity. These adjustments may include cleaning of the MS ion source, or other maintenance as indicated in Section 10.7.4. Major instrument maintenance requires recalibration (Sect 10.6) and verification of sensitivity by analyzing a CCV at or below the RL (Sect 10.7). Control charts are useful aids in documenting system sensitivity changes.

**10.7.3** Calculate the concentration of each analyte and SUR in the CCV. The calculated amount for each analyte and SUR for medium and high level CCVs must be within  $\pm 30\%$  of the true value. The calculated amount for the lowest calibration point for each analyte must be within  $\pm 50\%$  and the SUR must be within  $\pm 30\%$  of the true value. If these conditions do not exist, then all data for the problem analyte must be considered invalid, and remedial action should be taken (Sect. 10.7.4) which may require recalibration. Any Field or QC Samples that have been analyzed since the last acceptable calibration verification should be reanalyzed after adequate calibration has been restored, with the following exception. **If the CCV fails because the calculated concentration is greater than 130% (150% for the low-level CCV) for a particular method analyte, and Field Sample extracts show no detection for that method analyte, non-detects may be reported without re-analysis.**

**10.7.4 REMEDIAL ACTION** – Failure to meet CCV QC performance criteria may require remedial action. Major maintenance, such as cleaning the electrospray probe, atmospheric pressure ionization source, cleaning the mass analyzer, replacing the LC column, etc., requires recalibration (Sect 10.6) and verification of sensitivity by analyzing a CCV at or below the RL (Sect 10.7).

## 10.8 EXTRACT ANALYSIS

- 10.8.1 Establish operating conditions equivalent to those summarized in Tables 5-8 of Section 16. Instrument conditions and columns should be optimized prior to the initiation of the IDC.
- 10.8.2 Establish an appropriate retention time window for each analyte. This should be based on measurements of actual retention time variation for each method analyte in CAL standard solutions analyzed on the LC over the course of time. A value of plus or minus three times the standard deviation of the retention time obtained for each method analyte while establishing the initial calibration and completing the IDC can be used to calculate a suggested window size. However, the experience of the analyst should weigh heavily on the determination of the appropriate retention window size.
- 10.8.3 Calibrate the system by either the analysis of a calibration curve (Sect. 10.6) or by confirming the initial calibration is still valid by analyzing a CCV as described in Section 10.7. If establishing an initial calibration, complete the IDC as described in Section 13.2.
- 10.8.4 Begin analyzing Field Samples, including QC samples, at their appropriate frequency by injecting the same size aliquots, under the same conditions used to analyze the CAL standards.
- 10.8.5 At the conclusion of data acquisition, use the same software that was used in the calibration procedure to identify peaks of interest in predetermined retention time windows. Use the data system software to examine the ion abundances of the peaks in the chromatogram. Identify an analyte by comparison of its retention time with that of the corresponding method analyte peak in a reference standard.
- 10.8.6 Comparison of the MS/MS mass spectra is not particularly useful given the limited  $\pm 0.5$  dalton mass range around a single product ion for each method analyte.
- 10.8.7 The analyst must not extrapolate beyond the established calibration range. If an analyte peak area exceeds the range of the initial calibration curve, the extract may be diluted with 96%:4% vol/vol) methanol:water solution and the appropriate amount of IS added to match the original concentration. Re-inject the diluted extract. Incorporate the dilution factor into the final concentration calculations. Acceptable SUR performance (Sect. 9.5.1.1) should be determined from the undiluted sample extract. The resulting data should be documented as a dilution, with an increased RL.

## 11. Data Evaluation, Calculations and Reporting

- 11.1 Complete chromatographic resolution is not necessary for accurate and precise measurements of analyte concentrations using MS/MS. In validating this method, concentrations were calculated by measuring the product ions listed in Table 8. Other ions may be selected at the discretion of the analyst.
- 11.2 Calculate analyte and SUR concentrations using the multipoint calibration established in Section 10.6. Do not use daily calibration verification data to quantitate analytes in samples. Adjust final analyte concentrations to reflect the actual sample volume determined in Section 10.5.

- 11.3** Prior to reporting the data, the chromatogram should be reviewed for any incorrect peak identification or poor integration.
- 11.4** PFHxS, PFOS, NMeFOSAA, and NEtFOSAA have multiple chromatographic peaks using the LC conditions in Table 5 due to the linear and branch isomers of these compounds (Sect. 10.6.4.1). The areas of all the linear and branched isomer peaks observed in the CAL standards for each of these analytes must be summed and the concentrations reported as a total for each of these analytes.
- 11.5** Calculations must utilize all available digits of precision, but final reported concentrations should be rounded to an appropriate number of significant figures (one digit of uncertainty), typically two, and not more than three significant figures.

## 12. Contingencies for Handling Out-of-Control Data or Unacceptable Data

- 12.1** Section 9.0 outlines sample batch QC acceptance criteria. If non-compliant organic compound results are to be reported, the Organic Section Head and/or the Laboratory Director, and the Operations Manager must approve the reporting of these results. The laboratory Project Manager shall be notified, and may choose to relay the non-compliance to the client, for approval, or other corrective action, such as re-sampling and re-analysis. The analyst, Data Reviewer, or Department Supervisor performing the secondary review initiates the project narrative, and the narrative must clearly document the non-compliance and provide a reason for acceptance of these results.
- 12.2** All results for the organic compounds of interest are reportable without qualification if extraction and analytical holding times are met, preservation requirements (including cooler temperatures) are met, all QC criteria defined in the table below are met, and matrix interference is not suspected during extraction or analysis of the samples. If any of the below QC parameters are not met, all associated samples must be evaluated for re-extraction and/or re-analysis.

## 13. Method Performance

### 13.1 Detection Limit Study (DL) / Limit of Detection Study (LOD) / Limit of Quantitation (LOQ)

- 13.1.1** The laboratory follows the procedure to determine the DL, LOD, and/or LOQ as outlined in Alpha SOP ID 1732. These studies performed by the laboratory are maintained on file for review.

### 13.2 Demonstration of Capability Studies

- 13.2.1** The IDC must be successfully performed prior to analyzing any Field Samples. Prior to conducting the IDC, the analyst must first generate an acceptable Initial Calibration following the procedure outlined in Section 10.6.
- 13.2.2** INITIAL DEMONSTRATION OF LOW SYSTEM BACKGROUND – Any time a new lot of SPE cartridges, solvents, centrifuge tubes, disposable pipets, and autosampler vials are used, it must be demonstrated that an MB is reasonably free of contamination and that the criteria in Section 9.2.1 are met. If an automated extraction system is used, an MB should be extracted on each port to ensure that all the valves and tubing are free from potential PFAS contamination.

- 13.2.3** INITIAL DEMONSTRATION OF PRECISION (IDP) – Prepare, extract, and analyze four to seven replicate LCSs fortified near the midrange of the initial calibration curve according to the procedure described in Section 10. Sample preservatives as described in Section 6.2.1 must be added to these samples. The relative standard deviation (RSD) of the results of the replicate analyses must be less than 20%.
- 13.2.4** INITIAL DEMONSTRATION OF ACCURACY (IDA) – Using the same set of replicate data generated for Section 13.2.3, calculate average recovery. The average recovery of the replicate values must be within  $\pm 30\%$  of the true value.
- 13.2.5** INITIAL DEMONSTRATION OF PEAK ASYMMETRY FACTOR – Peak asymmetry factors must be calculated using the equation in Section 9.10.1 for the first two eluting peaks (if only two analytes are being analyzed, both must be evaluated) in a mid-level CAL standard. The peak asymmetry factors must fall in the range of 0.8 to 1.5. See guidance in Section 10.6.4.1 if the calculated peak asymmetry factors do not meet the criteria.
- 13.2.6** Refer to Alpha SOP ID 1739 for further information regarding IDC/DOC Generation.
- 13.2.7** The analyst must make a continuing, annual, demonstration of the ability to generate acceptable accuracy and precision with this method.

## 14. Pollution Prevention and Waste Management

- 14.1** Refer to Alpha's Chemical Hygiene Plan and Hazardous Waste Management and Disposal SOP for further pollution prevention and waste management information.
- 14.2** This method utilizes SPE to extract analytes from water. It requires the use of very small volumes of organic solvent and very small quantities of pure analytes, thereby minimizing the potential hazards to both the analyst and the environment as compared to the use of large volumes of organic solvents in conventional liquid-liquid extractions.
- 14.3** The analytical procedures described in this method generate relatively small amounts of waste since only small amounts of reagents and solvents are used. However, laboratory waste management practices must be conducted consistent with all applicable rules and regulations, and that laboratories protect the air, water, and land by minimizing and controlling all releases from fume hoods and bench operations. Also, compliance is required with any sewage discharge permits and regulations, particularly the hazardous waste identification rules and land disposal restrictions.

## 15. Referenced Documents

- 15.1** Chemical Hygiene Plan – ID 2124
- 15.2** SOP ID 1732 Detection Limit (DL), Limit of Detection (LOD) & Limit of Quantitation (LOQ) SOP
- 15.3** SOP ID 1739 Demonstration of Capability (DOC) Generation SOP
- 15.4** SOP ID 1728 Hazardous Waste Management and Disposal SOP

## 16. Attachments

**Table 6: LC Method Conditions**

Time (min)	2 mM Ammonium Acetate (5:95 MeOH/H <sub>2</sub> O)	2 mM Ammonium Acetate (100% Methanol)
Initial	100.0	0.0
1.0	100.0	0.0
2.2	85.0	15.0
11	20.0	80.0
11.4	0.0	100.0
12.4	100.0	0.0
14.0	100.0	0.0
Waters Aquity UPLC ® BEHC <sub>18</sub> 2.1 x 50 mm packed with 1.7 µm BEH C <sub>18</sub> stationary phase Flow rate of 0.4 mL/min 2-5 µL injection		

**Table 7: ESI-MS Method Conditions**

ESI Conditions	
Polarity	Negative ion
Capillary needle voltage	.5 kV
Cone Gas Flow	20 L/hr
Nitrogen desolvation gas	1100 L/hr
Desolvation gas temp.	500 °C

**Table 8: Method Analyte Source, Retention Times (RTs), and IS References**

Analyte	Peak #	IS# Ref
PFBS	1	2
PFHxA	3	1
HFPO-DA	5	1
PFHpA	6	1
PFHxS	7	2
ADONA	8	1
PFOA	10	1
PFNA	11	1
PFOS	12	2
PFDA	14	1
9CL-PF3ONS	15	1
NMeFOSAA	17	3
PFUnA	18	3
NEtFOSAA	20	1
PFDoA	21	1
11CL-PFOUdS	22	1
PFTTrDA	23	1
PFTA	24	1
<sup>13</sup> C-PFHxA	2	1
<sup>13</sup> C-HFPO-DA	4	1
<sup>13</sup> C-PFDA	13	1
d <sub>5</sub> -NEtFOSAA	19	3
<sup>13</sup> C-PFOA-IS#1	9	-
<sup>13</sup> C-PFOS-IS#2	10	-
d <sub>3</sub> -NMeFOSAA-IS#3	16	-



Table 9: MS/MS Method Conditions

Segment <sup>a</sup>	Analyte	Precursor Ion <sup>b</sup> (m/z)	Product Ion <sup>b,c</sup> (m/z)
1	PFBS	299	80
2	PFHxA	313	269
4	HFPO-DA	285	169
5	PFHpA	363	319
6	PFHxS <sup>e</sup>	399	80
7	ADONA	377	251
9	PFOA	413	369
10	PFNA	463	419
11	9CL-PF3ONS	531	351
13	PFOS <sup>e</sup>	499	80
15	PFDA	513	469
17	NMeFOSAA <sup>e</sup>	570	419
19	NEtFOSAA <sup>e</sup>	584	419
20	11CL-PFOUdS	631	451
21	PUnA	563	519
22	PFDaA	613	569
23	PFTrDA	663	619
24	PFTA	713	669
2	<sup>13</sup> C-PFHxA	315	270
3	<sup>13</sup> C-HFPO-DA	287	169
14	<sup>13</sup> C-PFDA	515	470
16	d <sub>5</sub> -NEtFOSAA	589	419
8	<sup>13</sup> C-PFOA	415	370
12	<sup>13</sup> C-PFOS	503	80
18	d <sub>3</sub> -NMeFOSAA	573	419

- <sup>a</sup> Segments are time durations in which single scan events occur; segments overlap where R.T. dictate.
- <sup>b</sup> Precursor and product ions listed in this table are nominal masses. During MS and MS/MS optimization, the analyst should determine the precursor and product ion masses to one decimal place by locating the apex of the mass spectral peak place. These precursor and product ion masses (with one decimal place) should be used in the MS/MS method for all analyses.
- <sup>c</sup> Ions used for quantitation purposes.
- <sup>d</sup> Argon used as collision gas at a flow rate of 0.4 mL/min
- <sup>e</sup> Analyte has multiple resolved chromatographic peaks due to linear and branched isomers. All peaks summed for quantitation purposes.

## Determination of Selected Perfluorinated Alkyl Substances by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry Isotope Dilution (LC/MS/MS)

**References:** EPA Method 537.1, Version 2, March 2020, EPA Document #: EPA/600/R-20/006

Department of Defense, Quality Systems Manual for Environmental Laboratories, Version 5.3, 2019

### 1. Scope and Application

**Matrices:** Drinking water, Non-potable Water, , Tissues, Biosolids and Soil Matrices (Drinking water is applicable for specific state regulatory requirements for this method)

**Definitions:** Refer to Alpha Analytical Quality Manual.

- 1.1** This is a liquid chromatography/tandem mass spectrometry (LC/MS/MS) method for the determination of selected perfluorinated alkyl substances (PFAS) in Non-Drinking Water and soil Matrices. Accuracy and precision data have been generated in reagent water, and finished ground and surface waters and soils for the compounds listed in Table 1.
- 1.2** The data report packages present the documentation of any method modification related to the samples tested. Depending upon the nature of the modification and the extent of intended use, the laboratory may be required to demonstrate that the modifications will produce equivalent results for the matrix. Approval of all method modifications is by one or more of the following laboratory personnel before performing the modification: Area Supervisor, Department Supervisor, Laboratory Director, or Quality Assurance Officer.
- 1.3** This method is restricted to use by or under the supervision of analysts experienced in the operation of the LC/MS/MS and in the interpretation of LC/MS/MS data. Each analyst must demonstrate the ability to generate acceptable results with this method by performing an initial demonstration of capability.

### 2. Summary of Method

- 2.1** A 250-mL water sample is fortified with extracted internal standards (EIS) and passed through a solid phase extraction (WAX) cartridge containing a mixed mode, Weak Anion Exchange, reversed phase, water-wettable polymer to extract the method analytes and isotopically-labeled compounds. The compounds are eluted from the solid phase in two fractions with methanol followed by a small amount of 2% ammonium hydroxide in methanol solution. The extract is concentrated with nitrogen in a heated water bath, and then adjusted to a 1-mL volume with 80:20% (vol/vol) methanol:water.  
  
A 2-4 gram soil, solid, tissue or biosolid sample is is fortified with extracted internal standards (EIS), diluted in methanol and agitated rigorously. An aliquot of the methanol is passed across an SPE based clean-up cartridge and the eluate collected. The extract is concentrated with nitrogen in a heated water bath, and then adjusted to a 1-mL volume with 80:20% (vol/vol) methanol:water.
- 2.2** A 3 µl injection is made into an LC equipped with a C18 column that is interfaced to an MS/MS. The analytes are separated and identified by comparing the acquired mass spectra and retention times to reference spectra and retention times for calibration standards acquired under identical LC/MS/MS conditions. The concentration of each analyte is

determined by using the isotope dilution technique. Extracted Internal Standards (EIS) analytes are used to monitor the extraction efficiency of the method analytes.

### 2.3 Method Modifications from Reference

None.

Table 1

Parameter	Acronym	CAS
<b>PERFLUOROALKYL ETHER CARBOXYLIC ACIDS (PFECAs)</b>		
Tetrafluoro-2-(heptafluoropropoxy)propanoic acid	HFPO-DA	13252-13-6
4,8-dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4
<b>PERFLUOROALKYLCARBOXILIC ACIDS (PFCAs)</b>		
Perfluorobutanoic acid	PFBA	375-22-4
Perfluoropentanoic acid	PFPeA	2706-90-3
Perfluorohexanoic acid	PFHxA *	307-24-4
Perfluoroheptanoic acid	PFHpA *	375-85-9
Perfluorooctanoic acid	PFOA *	335-67-1
Perfluorononanoic acid	PFNA *	375-95-1
Perfluorodecanoic acid	PFDA *	335-76-2
Perfluoroundecanoic acid	PFUnA *	2058-94-8
Perfluorododecanoic acid	PFDoA *	307-55-1
Perfluorotridecanoic acid	PFTTrDA *	72629-94-8
Perfluorotetradecanoic acid	PFTA *	376-06-7
Perfluorohexadecanoic acid	PFHxDA	67905-19-5
Perfluorooctadecanoic acid	PFODA	16517-11-6
<b>PERFLUOROALKYLSULFONATES (PFASs)</b>		
Perfluorobutanesulfonic acid	PFBS *	375-73-5
Perfluoropentanesulfonic acid	PFPeS	2706-91-4
Perfluorohexanesulfonic acid	PFHxS *	355-46-4
Perfluoroheptanesulfonic acid	PFHpS	375-92-8
Perfluorooctanesulfonic acid	PFOS *	1763-23-1
Perfluoronanesulfonic acid	PFNS	68259-12-1
Perfluorodecanesulfonic acid	PFDS	335-77-3
Perfluorododecanesulfonic acid	PFDoS	79780-39-5

\* also reportable via the standard 537 method

Table 1 Cont.

Parameter	Acronym	CAS
<b>CHLORO-PERFLUOROALKYLSULFONATE</b>		
11-chloroeicosafuoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OUdS	763051-92-9
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid	9Cl-PF3ONS	756426-58-1
<b>PERFLUOROCTANESULFONAMIDES (FOSAs)</b>		
Perfluorooctanesulfonamide	PFOSA	754-91-6
N-methylperfluoro-1-octanesulfonamide	NMeFOSA	31506-32-8
N-ethylperfluoro-1-octanesulfonamide	NEtFOSA	4151-50-2
<b>TELOMER SULFONATES</b>		
1H,1H,2H,2H-perfluorohexane sulfonate (4:2)	4:2FTS	27619-93-8
1H,1H,2H,2H-perfluorooctane sulfonate (6:2)	6:2FTS	27619-97-2
1H,1H,2H,2H-perfluorodecane sulfonate (8:2)	8:2FTS	39108-34-4
1H,1H,2H,2H-perfluorododecane sulfonate (10:2)	10:2FTS	120226-60-0
<b>PERFLUOROCTANESULFONAMIDOACETIC ACIDS</b>		
N-methyl perfluorooctanesulfonamidoacetic acid	NMeFOSAA *	2355-31-9
N-ethyl perfluorooctanesulfonamidoacetic acid	NEtFOSAA *	2991-50-6
<b>NATIVE PERFLUOROCTANESULFONAMIDOETHANOLS (FOSEs)</b>		
2-(N-methylperfluoro-1-octanesulfonamido)-ethanol	NMeFOSE	24448-09-7
2-(N-ethylperfluoro-1-octanesulfonamido)-ethanol	NEtFOSE	1691-99-2

\* also reportable via the standard 537 method

### 3. Reporting Limits

The reporting limit for PFAS's is 2 ng/L for aqueous samples (20 ng/L for HFPO-DA) and 1 ng/g (10 ng/g for HFPO-DA) for soil samples.

### 4. Interferences

**4.1** PFAS standards, extracts and samples should not come in contact with any glass containers or pipettes as these analytes can potentially adsorb to glass surfaces. PFAS analyte and EIS standards commercially purchased in glass ampoules are acceptable; however, all subsequent transfers or dilutions performed by the analyst must be prepared and stored in polypropylene containers.

**4.2** Method interferences may be caused by contaminants in solvents, reagents (including reagent water), sample bottles and caps, and other sample processing hardware that lead to discrete artifacts and/or elevated baselines in the chromatograms. The method analytes in this method can also be found in many common laboratory supplies and equipment, such as PTFE (polytetrafluoroethylene) products, LC solvent lines, methanol, aluminum foil, SPE sample transfer lines, etc. All items such as these must be routinely demonstrated to be free from interferences (less than 1/3 the RL for each method analyte) under the conditions of the analysis by analyzing laboratory reagent blanks as described in Section 9.2. **Subtracting blank values from sample results is not permitted.**

- 4.3** Matrix interferences may be caused by contaminants that are co-extracted from the sample. The extent of matrix interferences will vary considerably from source to source, depending upon the nature of the water. Humic and/or fulvic material can be co-extracted during SPE and high levels can cause enhancement and/or suppression in the electrospray ionization source or low recoveries on the SPE sorbent. Total organic carbon (TOC) is a good indicator of humic content of the sample.
- 4.4** SPE cartridges can be a source of interferences. The analysis of field and laboratory reagent blanks can provide important information regarding the presence or absence of such interferences. Brands and lots of SPE devices should be tested to ensure that contamination does not preclude analyte identification and quantitation.

## 5. Health and Safety

- 5.1** The toxicity or carcinogenicity of each reagent and standard used in this method is not fully established; however, each chemical compound should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. A reference file of material safety data sheets is available to all personnel involved in the chemical analysis. Additional references to laboratory safety are available in the Chemical Hygiene Plan.
- 5.2** All personnel handling environmental samples known to contain or to have been in contact with municipal waste must follow safety practices for handling known disease causative agents.
- 5.3** PFOA has been described as “likely to be carcinogenic to humans.” Pure standard materials and stock standard solutions of these method analytes should be handled with suitable protection to skin and eyes, and care should be taken not to breathe the vapors or ingest the materials.

## 6. Sample Collection, Preservation, Shipping and Handling

### 6.1 Sample Collection for Aqueous Samples

- 6.1.1** Samples must be collected in two (2) 250-mL high density polyethylene (HDPE) container with an unlined plastic screw cap.
- 6.1.2** The sample handler must wash their hands before sampling and wear nitrile gloves while filling and sealing the sample bottles. PFAS contamination during sampling can occur from a number of common sources, such as food packaging and certain foods and beverages. Proper hand washing and wearing nitrile gloves will aid in minimizing this type of accidental contamination of the samples.
- 6.1.3** Open the tap and allow the system to flush until the water temperature has stabilized (approximately 3 to 5 min). Collect samples from the flowing system.
- 6.1.4** Fill sample bottles. Samples do not need to be collected headspace free.
- 6.1.5** After collecting the sample and cap the bottle. Keep the sample sealed from time of collection until extraction.

#### 6.1.6 Field Reagent Blank (FRB)

**6.1.6.1** A FRB must be handled along with each sample set. The sample set is composed of samples collected from the same sample site and at the same time. At the laboratory, fill the field blank sample bottle with reagent water and preservatives, seal, and ship to the sampling site along with the sample bottles. For each FRB shipped, an empty sample bottle (no preservatives) must also be shipped. At the sampling site, the sampler must open the shipped FRB and pour the reagent water into the empty shipped sample bottle, seal and label this bottle as the FRB. The FRB is shipped back to the laboratory along with the samples and analyzed to ensure that PFAS's were not introduced into the sample during sample collection/handling.

The reagent water used for the FRBs must be initially analyzed for method analytes as a MB and must meet the MB criteria in Section 9.2.1 prior to use. This requirement will ensure samples are not being discarded due to contaminated reagent water rather than contamination during sampling.

### 6.2 Sample Collection for Soil and Sediment samples.

Grab samples are collected in polypropylene containers. Sample containers and contact surfaces containing PTFE shall be avoided.

### 6.3 Sample Preservation

Not applicable.

### 6.4 Sample Shipping

Samples must be chilled during shipment and must not exceed 10 °C during the first 48 hours after collection. Sample temperature must be confirmed to be at or below 10 °C when the samples are received at the laboratory. Samples stored in the lab must be held at or below 6 °C until extraction, but should not be frozen.

**NOTE:** Samples that are significantly above 10° C, at the time of collection, may need to be iced or refrigerated for a period of time, in order to chill them prior to shipping. This will allow them to be shipped with sufficient ice to meet the above requirements.

### 6.5 Sample Handling

#### 6.5.1 Holding Times

**6.5.1.1** Water samples should be extracted as soon as possible but must be extracted within 14 days. Soil samples should be extracted within 14 days. Extracts are stored at < 10 ° C and analyzed within 28 days after extraction.

## 7. Equipment and Supplies

**7.1** SAMPLE CONTAINERS – 250-mL high density polyethylene (HDPE) bottles fitted with unlined screw caps. Sample bottles must be discarded after use.

**7.2** SAMPLE JARS – 8 ounce wide mouth high density polyethylene (HDPE) bottles fitted with unlined screw caps. Sample bottles must be discarded after use.

- 7.3** POLYPROPYLENE BOTTLES – 4-mL narrow-mouth polypropylene bottles.
- 7.4** CENTRIFUGE TUBES – 50-mL conical polypropylene tubes with polypropylene screw caps for storing standard solutions and for collection of the extracts.
- 7.5** AUTOSAMPLER VIALS – Polypropylene 0.7-mL autosampler vials with polypropylene caps.
- 7.5.1** NOTE: Polypropylene vials and caps are necessary to prevent contamination of the sample from PTFE coated septa. However, polypropylene caps do not reseal, so evaporation occurs after injection. Thus, multiple injections from the same vial are not possible.
- 7.6** POLYPROPYLENE GRADUATED CYLINDERS – Suggested sizes include 25, 50, 100 and 1000-mL cylinders.
- 7.7** Auto Pipets – Suggested sizes include 5, 10, 25, 50, 100, 250, 500, 1000, 5000 and 10,000- $\mu$ ls.
- 7.8** PLASTIC PIPETS – Polypropylene or polyethylene disposable pipets.
- 7.9** ANALYTICAL BALANCE – Capable of weighing to the nearest 0.0001 g.
- 7.10** ANALYTICAL BALANCE – Capable of weighing to the nearest 0.1 g.
- 7.11** SOLID PHASE EXTRACTION (SPE) APPARATUS FOR USING CARTRIDGES
- 7.11.1** SPE CARTRIDGES – 0.5 g SPE cartridges containing a reverse phase copolymer characterized by a weak anion exchanger (WAX) sorbent phase.
- 7.11.2** VACUUM EXTRACTION MANIFOLD – A manual vacuum manifold with large volume sampler for cartridge extractions, or an automatic/robotic sample preparation system designed for use with SPE cartridges, may be used if all QC requirements discussed in Section 9 are met. Extraction and/or elution steps may not be changed or omitted to accommodate the use of an automated system. Care must be taken with automated SPE systems to ensure the PTFE commonly used in these systems does not contribute to unacceptable analyte concentrations in the MB (Sect. 9.2.1).
- 7.11.3** SAMPLE DELIVERY SYSTEM – Use of a polypropylene transfer tube system, which transfers the sample directly from the sample container to the SPE cartridge, is recommended, but not mandatory. Standard extraction manifolds come equipped with PTFE transfer tube systems. These can be replaced with 1/8" O.D. x 1/16" I.D. polypropylene or polyethylene tubing cut to an appropriate length to ensure no sample contamination from the sample transfer lines. Other types of non-PTFE tubing may be used provided it meets the MB (Sect. 9.2.1) and LCS (Sect. 9.3) QC requirements. The PTFE transfer tubes may be used, but an MB must be run on each PTFE transfer tube and the QC requirements in Section 13.2.2 must be met. In the case of automated SPE, the removal of PTFE lines may not be feasible; therefore, MBs will need to be rotated among the ports and must meet the QC requirements of Sections 13.2.2 and 9.2.1.
- 7.12** Extract Clean-up Cartridge – 250 mg 6ml SPE Cartridge containing graphitized polymer carbon
- 7.13** EXTRACT CONCENTRATION SYSTEM – Extracts are concentrated by evaporation with nitrogen using a water bath set no higher than 65 °C.

**7.14** LABORATORY OR ASPIRATOR VACUUM SYSTEM – Sufficient capacity to maintain a vacuum of approximately 10 to 15 inches of mercury for extraction cartridges.

**7.15** LIQUID CHROMATOGRAPHY (LC)/TANDEM MASS SPECTROMETER (MS/MS) WITH DATA SYSTEM

**7.15.1** LC SYSTEM – Instrument capable of reproducibly injecting up to 10- $\mu$ L aliquots, and performing binary linear gradients at a constant flow rate near the flow rate used for development of this method (0.4 mL/min). The LC must be capable of pumping the water/methanol mobile phase without the use of a degasser which pulls vacuum on the mobile phase bottle (other types of degassers are acceptable). Degassers which pull vacuum on the mobile phase bottle will volatilize the ammonium acetate mobile phase causing the analyte peaks to shift to earlier retention times over the course of the analysis batch. The usage of a column heater is optional.

**7.15.2** LC/TANDEM MASS SPECTROMETER – The LC/MS/MS must be capable of negative ion electrospray ionization (ESI) near the suggested LC flow rate of 0.4 mL/min. The system must be capable of performing MS/MS to produce unique product ions for the method analytes within specified retention time segments. A minimum of 10 scans across the chromatographic peak is required to ensure adequate precision.

**7.15.3** DATA SYSTEM – An interfaced data system is required to acquire, store, reduce, and output mass spectral data. The computer software should have the capability of processing stored LC/MS/MS data by recognizing an LC peak within any given retention time window. The software must allow integration of the ion abundance of any specific ion within specified time or scan number limits. The software must be able to calculate relative response factors, construct linear regressions or quadratic calibration curves, and calculate analyte concentrations.

**7.15.4** ANALYTICAL COLUMN – An LC BEH C<sub>18</sub> column (2.1 x 50 mm) packed with 1.7  $\mu$ m d<sub>p</sub> C<sub>18</sub> solid phase particles was used. Any column that provides adequate resolution, peak shape, capacity, accuracy, and precision (Sect. 9) may be used.

## 8. Reagents and Standards

**8.1** GASES, REAGENTS, AND SOLVENTS – Reagent grade or better chemicals must be used.

**8.1.1** REAGENT WATER – Purified water which does not contain any measurable quantities of any method analytes or interfering compounds greater than 1/3 the RL for each method analyte of interest. Prior to daily use, at least 3 L of reagent water should be flushed from the purification system to rinse out any build-up of analytes in the system's tubing.

**8.1.2** METHANOL (CH<sub>3</sub>OH, CAS#: 67-56-1) – High purity, demonstrated to be free of analytes and interferences.

**8.1.3** AMMONIUM ACETATE (NH<sub>4</sub>C<sub>2</sub>H<sub>3</sub>O<sub>2</sub>, CAS#: 631-61-8) – High purity, demonstrated to be free of analytes and interferences.

**8.1.4** ACETIC ACID (H<sub>3</sub>CCOOH, CAS#: 64-19-7) - High purity, demonstrated to be free of analytes and interferences.



- 8.1.5 1M AMMONIUM ACETATE/REAGENT WATER – High purity, demonstrated to be free of analytes and interferences.
  - 8.1.6 2mM AMMONIUM ACETATE/METHANOL:WATER (5:95) – To prepare, mix 2 ml of 1M AMMONIUM ACETATE, 1 ml ACETIC ACID and 50 ml METHANOL into 1 Liter of REAGENT WATER.
  - 8.1.7 Methanol/Water (80:20) – To prepare a 1 Liter bottle, mix 200 ml of REAGENT WATER with 800 ml of METHANOL.
  - 8.1.8 AMMONIUM HYDROXIDE (NH<sub>3</sub>, CAS#: 1336-21-6) – High purity, demonstrated to be free of analytes and interferences.
  - 8.1.9 Sodium Acetate (NaOOCCH<sub>3</sub>, CAS#: 127-09-3) – High purity, demonstrated to be free of analytes and interferences.
  - 8.1.10 25 mM Sodium Acetate Buffer – To prepare 250mls, dissolve .625 grams of sodium acetate into 100 mls of reagent water. Add 4 mls Acetic Acid and adjust the final volume to 250 mls with reagent water.
  - 8.1.11 NITROGEN – Used for the following purposes: Nitrogen aids in aerosol generation of the ESI liquid spray and is used as collision gas in some MS/MS instruments. The nitrogen used should meet or exceed instrument manufacturer's specifications. In addition, Nitrogen is used to concentrate sample extracts (Ultra High Purity or equivalent).
  - 8.1.12 ARGON – Used as collision gas in MS/MS instruments. Argon should meet or exceed instrument manufacturer's specifications. Nitrogen gas may be used as the collision gas provided sufficient sensitivity (product ion formation) is achieved.
- 8.2 STANDARD SOLUTIONS – When a compound purity is assayed to be 96% or greater, the weight can be used without correction to calculate the concentration of the stock standard. PFAS analyte and IS standards commercially purchased in glass ampoules are acceptable; however, all subsequent transfers or dilutions performed by the analyst must be prepared and stored in polypropylene containers. Standards for sample fortification generally should be prepared in the smallest volume that can be accurately measured to minimize the addition of excess organic solvent to aqueous samples.

**NOTE:** Stock standards and diluted stock standards are stored at ≤4 °C.

- 8.2.1 ISOTOPE DILUTION Extracted Internal Standard (ID EIS) STOCK SOLUTIONS - ID EIS stock standard solutions are stable for at least 6 months when stored at 4 °C. The stock solution is purchased at a concentration of 1000 ng/mL.
- 8.2.2 ISOTOPE DILUTION Extracted Internal Standard PRIMARY DILUTION STANDARD (ID EIS PDS) – Prepare the ID EIS PDS at a concentration of 500 ng/mL. The ID PDS is prepared in 80:20% (vol/vol) methanol:water. The ID PDS is stable for 6 months when stored at ≤4 °C.

Table 2

Isotope Labeled Standard	Conc. of EIS Stock (ng/mL)	Vol. of EIS Stock (mL)	Final Vol. of EIS PDS (mL)	Final Conc. of EIS PDS (ng/mL)
M4PFBA	1000	1.0	2.0	500
M5PFPeA	1000	1.0	2.0	500
M5PFHxA	1000	1.0	2.0	500
M4PFHpA	1000	1.0	2.0	500
M8PFOA	1000	1.0	2.0	500
M9PFNA	1000	1.0	2.0	500
M6PFDA	1000	1.0	2.0	500
M7PFUdA	1000	1.0	2.0	500
MPFDoA	1000	1.0	2.0	500
M2PFTeDA	1000	1.0	2.0	500
M2PFHxDA	50,000	.02	2.0	500
d3-N-MeFOSA	50,000	.02	2.0	500
d5-N-EtFOSA	50,000	.02	2.0	500
d7-N-MeFOSE	50,000	.02	2.0	500
d9-N-EtFOSE	50,000	.02	2.0	500
M8FOSA	1000	1.0	2.0	500
d3-N-MeFOSAA	1000	1.0	2.0	500
d5-N-EtFOSAA	1000	1.0	2.0	500
M3PFBS	929	1.0	2.0	464.5
M3PFHxS	946	1.0	2.0	473
M8PFOS	957	1.0	2.0	478.5
M2-4:2FTS	935	1.0	2.0	467.5
M2-6:2FTS	949	1.0	2.0	474.5
M2-8:2FTS	958	1.0	2.0	479
M3HFPO-DA	50,000	.4	2.0	10,000

**8.2.3** ANALYTE STOCK STANDARD SOLUTION – Analyte stock standards are stable for at least 6 months when stored at 4 °C. When using these stock standards to prepare a PDS, care must be taken to ensure that these standards are at room temperature and adequately vortexed.

**8.2.4** Analyte Secondary Spiking Standard Prepare the spiking solution of additional add on components for project specific requirements only. ANALYTE PRIMARY SPIKING STANDARD – Prepare the spiking standard at a concentration of 500 ng/mL in methanol. The spiking standard is stable for at least two months when stored in polypropylene centrifuge tubes at room temperature.

Table 3

Analyte	Conc. of Stock (ng/mL)	Vol. of Stock (mL)	Final Vol. of PDS (mL)	Final Conc. of PDS (ng/mL)
PFBA	2000	1	4	500
PFPeA	2000	1	4	500
PFHxA	2000	1	4	500
PFHpA	2000	1	4	500
PFOA	2000	1	4	500
PFNA	2000	1	4	500
PFDA	2000	1	4	500
PFUdA	2000	1	4	500
PFDaA	2000	1	4	500
PFTTrDA	2000	1	4	500
PFTeDA	2000	1	4	500
FOSA	2000	1	4	500
N-MeFOSAA	2000	1	4	500
N-EtFOSAA	2000	1	4	500
L-PFBS	1770	1	4	442.5
L-PFPeS	1880	1	4	470
L-PFHxSK	1480	1	4	370
Br-PFHxSK	344	1	4	86
L-PFHpS	1900	1	4	475
L-PFOSK	1460	1	4	365
Br-PFOSK	391	1	4	97.75
L-PFNS	1920	1	4	480
L-PFDS	1930	1	4	482.5
4:2FTS	1870	1	4	467.5
6:2FTS	1900	1	4	475
8:2FTS	1920	1	4	480

8.2.5 Analyte Secondary Spiking Standard Prepare the spiking solution of additional add on components for project specific requirements only.

Table 4

Analyte	Conc. of IS Stock (ng/mL)	Vol. of IS Stock (mL)	Final Vol. of IS PDS (mL)	Final Conc. of IS PDS (ng/mL)
ADONA	2000	1	4	500
PFHxDA	2000	1	4	500
PFODA	2000	1	4	500
HFPO-DA	100,000	.4	4	10,000
9CIPF3ONS	50,000	0.04	4	500
11CIPF3OUdS	50,000	0.04	4	500

8.2.6 LOW, MEDIUM AND HIGH LEVEL LCS – The LCS's will be prepared at the following concentrations and rotated per batch; 2 ng/L, 40 ng/L, 500 ng/l for drinking waters. The analyte PDS contains all the method analytes of interest at

various concentrations in methanol. The analyte PDS has been shown to be stable for six months when stored at  $\leq 4$  °C.

- 8.2.7 Isotope Dilution Labeled Recovery Stock Solutions (ID REC) – ID REC Stock solutions are stable for at least 6 months when stored at 4 °C. The stock solution is purchased at a concentration of 1000 ng/mL.
- 8.2.8 Isotope Dilution Labeled Recovery Primary Dilution Standard (ID REC PDS) - Prepare the ID REC PDS at a concentration of 500 ng/mL. The ID REC PDS is prepared in 80:20% (vol/vol) methanol:water. The ID REC PDS is stable for at least six months when stored in polypropylene centrifuge tubes at  $\leq 4$  °C.

Table 5

Analyte	Conc. of REC Stock (ng/mL)	Vol. of REC Stock (mL)	Final Vol. of REC PDS (mL)	Final Conc. of REC PDS (ng/mL)
M2PFOA	2000	1	4	500
M2PFDA	2000	1	4	500
M3PFBA	2000	1	4	500
M4PFOS	2000	1	4	500

8.2.9 CALIBRATION STANDARDS (CAL) –

Current Concentrations (ng/mL): 0.5, 1.0, 5.0, 10.0, 50.0, 125, 150, 250, 500

Prepare the CAL standards over the concentration range of interest from dilutions of the analyte PDS in methanol containing 20% reagent water. 20  $\mu$ l of the EIS PDS and REC PDS are added to the CAL standards to give a constant concentration of 10 ng/ml. The lowest concentration CAL standard must be at or below the RL (2 ng/L), which may depend on system sensitivity. The CAL standards may also be used as CCVs (Sect. 9.8). To make calibration stock standards:

Table 6

Calibration Standard Concentration	Final Aqueous Cal STD Level Concentration	Final Soil Cal STD Level Concentration	24 compound stock added (ul)	PFHxDA Stock added (ul)	500 ng/ml PFHxDA dilution added (ul)	PFODA Stock added (ul)	500 ng/ml PFODA dilution added (ul)	ADONA, HFPO-DA, 11Cl-PF3OUdS, 9Cl-PF3ONS Stock added (ul)	500 ng/ml ADONA dilution added (ul)	Final Volume in MeOH/H <sub>2</sub> O (82:20)
.5 ng/ml	2 ng/L	.25 ng/g	6.25		25		25		25	25 mls
1 ng/ml	4 ng/L	.5 ng/g	5		20		20		20	10 mls
5 ng/ml	20 ng/L	1 ng/g	25		100		100		100	10 mls
10 ng/ml	40 ng/L	5 ng/g	125	5		5		5		25 mls
50 ng/ml	200 ng/L	25 ng/g	250	10		10		10		10 mls
125 ng/ml	500 ng/L	62.5 ng/g	625	25		25		25		10 mls
150 ng/ml	600 ng/L	75 ng/g	750	30		30		30		10 mls
250 ng/ml	1000 ng/L	125 ng/g	625							5 mls
500 ng/ml	2000 ng/L	250 ng/g	1250							5 mls

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## 9. Quality Control

The laboratory must maintain records to document the quality of data that is generated. Ongoing data quality checks are compared with established performance criteria to determine if the results of analyses meet the performance characteristics of the method.

### 9.1 MINIMUM REPORTING LIMIT (MRL) CONFIRMATION

- 9.1.1 Fortify, extract, and analyze seven replicate LCSs at 2 ng/l. Calculate the mean measured concentration (*Mean*) and standard deviation for these replicates. Determine the Half Range for the prediction interval of results ( $HR_{PIR}$ ) using the equation below

$$HR_{PIR} = 3.963s$$

Where:

*s* = the standard deviation

3.963 = a constant value for seven replicates.

- 9.1.2 Confirm that the upper and lower limits for the Prediction Interval of Result ( $PIR = Mean \pm HR_{PIR}$ ) meet the upper and lower recovery limits as shown below

The Upper PIR Limit must be  $\leq 150\%$  recovery.

$$\frac{Mean + HR_{PIR}}{Fortified\ Concentration} \times 100\% \leq 150\%$$

The Lower PIR Limit must be  $\geq 50\%$  recovery.

$$\frac{Mean - HR_{PIR}}{Fortified\ Concentration} \times 100\% \geq 50\%$$

- 9.1.3 The RL is validated if both the Upper and Lower PIR Limits meet the criteria described above. If these criteria are not met, the RL has been set too low and must be determined again at a higher concentration.

### 9.2 Blank(s)

- 9.2.1 **METHOD BLANK (MB)** - A Method Blank (MB) is required with each extraction batch to confirm that potential background contaminants are not interfering with the identification or quantitation of method analytes. Prep and analyze a MB for every 20 samples. If the MB produces a peak within the retention time window of any analyte that would prevent the determination of that analyte, determine the source of contamination and eliminate the interference before processing samples. Background contamination must be reduced to an acceptable level before proceeding. Background from method analytes or other contaminants that interfere with the measurement of method analytes must be below the RL. If the method analytes are detected in the MB at concentrations equal to or greater than this level, then all data for the problem analyte(s) must be considered invalid for all samples in the extraction batch. Because background contamination is a significant problem for several method analytes, it is highly recommended that the analyst maintain a historical record of MB data.

**9.2.2 FIELD REAGENT BLANK (FRB)** - The purpose of the FRB is to ensure that PFAS's measured in the Field Samples were not inadvertently introduced into the sample during sample collection/handling. Analysis of the FRB is required only if a Field Sample contains a method analyte or analytes at or above the RL. The FRB is processed, extracted and analyzed in exactly the same manner as a Field Sample.

### 9.3 Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicates (LCSD)

**9.3.1** An LCS is required with each extraction batch. The fortified concentration of the LCS may be rotated between low, medium, and high concentrations from batch to batch. Default limits of 50-150% of the true value may be used for analytes until sufficient replicates have been analyzed to generate proper control limits. Calculate the percent recovery (%R) for each analyte using the equation

$$\%R = \frac{A \times 100}{B}$$

Where:

*A* = measured concentration in the fortified sample  
*B* = fortification concentration.

**9.3.2** Where applicable, LCSD's are to be extracted and analyzed. The concentration and analyte recovery criteria for the LCSD must be the same as the batch LCS. The RSD's must fall within  $\leq 30\%$  of the true value for medium and high level replicates, and  $\leq 50\%$  for low level replicates. Calculate the relative percent difference (RPD) for duplicate MSs (MS and MSD) using the equation

$$RPD = \frac{|LCS - LCSD|}{(LCS + LCSD) / 2} \times 100$$

**9.3.3** If the LCS and or LCSD results do not meet these criteria for method analytes, then all data for the problem analyte(s) must be considered invalid for all samples in the extraction batch.

### 9.4 Labeled Recovery Standards (REC)

The analyst must monitor the peak areas of the REC(s) in all injections during each analysis day.

### 9.5 Extracted Internal Standards (EIS)

**9.5.1** The EIS standard is fortified into all samples, CCVs, MBs, LCSs, MSs, MSDs, FD, and FRB prior to extraction. It is also added to the CAL standards. The EIS is a means of assessing method performance from extraction to final chromatographic measurement. Calculate the recovery (%R) for the EIS using the following equation:

$$\%R = (A / B) \times 100$$

Where:

*A* = calculated EIS concentration for the QC or Field Sample  
*B* = fortified concentration of the EIS.

- 9.5.2** Default limits of 50-150% may be used for analytes until sufficient replicates have been analyzed to generate proper control limits. A low or high percent recovery for a sample, blank, or CCV does not require discarding the analytical data but it may indicate a potential problem with future analytical data. When EIS recovery from a sample, blank, or CCV are outside control limits, check 1) calculations to locate possible errors, 2) standard solutions for degradation, 3) contamination, and 4) instrument performance. For CCVs and QC elements spiked with all target analytes, if the recovery of the corresponding target analytes meet the acceptance criteria for the EIS in question, the data can be used but all potential biases in the recovery of the EIS must be documented in the sample report. If the associated target analytes do not meet the acceptance criteria, the data must be reanalyzed.

## 9.6 Matrix Spike (MS)

- 9.6.1** Analysis of an MS is required in each extraction batch and is used to determine that the sample matrix does not adversely affect method accuracy. Assessment of method precision is accomplished by analysis of a Field Duplicate (FD) (Sect. 9.6); however, infrequent occurrence of method analytes would hinder this assessment. If the occurrence of method analytes in the samples is infrequent, or if historical trends are unavailable, a second MS, or MSD, must be prepared, extracted, and analyzed from a duplicate of the Field Sample. Extraction batches that contain MSDs will not require the extraction of a field sample duplicate. If a variety of different sample matrices are analyzed regularly, for example, drinking water from groundwater and surface water sources, method performance should be established for each. Over time, MS data should be documented by the laboratory for all routine sample sources.
- 9.6.2** Within each extraction batch, a minimum of one Field Sample is fortified as an MS for every 20 Field Samples analyzed. The MS is prepared by spiking a sample with an appropriate amount of the Analyte Stock Standard (Sect. 8.2.3). Use historical data and rotate through the low, mid and high concentrations when selecting a fortifying concentration. Calculate the percent recovery (%R) for each analyte using the equation

$$\%R = \frac{(A - B)}{C} \times 100$$

Where:

*A* = measured concentration in the fortified sample  
*B* = measured concentration in the unfortified sample  
*C* = fortification concentration.

- 9.6.3** Analyte recoveries may exhibit matrix bias. For samples fortified at or above their native concentration, recoveries should range between 50-150%. If the accuracy of any analyte falls outside the designated range, and the laboratory performance for that analyte is shown to be in control in the LCS, the recovery is judged to be matrix biased. The result for that analyte in the unfortified sample is labeled suspect/matrix to inform the data user that the results are suspect due to matrix effects.

## 9.7 Laboratory Duplicate

- 9.7.1 FIELD DUPLICATE OR LABORATORY FORTIFIED SAMPLE MATRIX DUPLICATE (FD or MSD) – Within each extraction batch (not to exceed 20 Field Samples), a minimum of one FD or MSD must be analyzed. Duplicates check the precision associated with sample collection, preservation, storage, and laboratory procedures. If method analytes are not routinely observed in Field Samples, an MSD should be analyzed rather than an FD.
- 9.7.2 Calculate the relative percent difference (RPD) for duplicate measurements (FD1 and FD2) using the equation

$$RPD = \frac{|FD1 - FD2|}{(FD1 + FD2) / 2} \times 100$$

- 9.7.3 RPDs for FDs should be  $\leq 30\%$ . Greater variability may be observed when FDs have analyte concentrations that are within a factor of 2 of the RL. At these concentrations, FDs should have RPDs that are  $\leq 50\%$ . If the RPD of any analyte falls outside the designated range, and the laboratory performance for that analyte is shown to be in control in the CCV, the recovery is judged to be matrix biased. The result for that analyte in the unfortified sample is labeled suspect/matrix to inform the data user that the results are suspect due to matrix effects.
- 9.7.4 If an MSD is analyzed instead of a FD, calculate the relative percent difference (RPD) for duplicate MSs (MS and MSD) using the equation

$$RPD = \frac{|MS - MSD|}{(MS + MSD) / 2} \times 100$$

- 9.7.5 RPDs for duplicate MSs should be  $\leq 30\%$  for samples fortified at or above their native concentration. Greater variability may be observed when MSs are fortified at analyte concentrations that are within a factor of 2 of the RL. MSs fortified at these concentrations should have RPDs that are  $\leq 50\%$  for samples fortified at or above their native concentration. If the RPD of any analyte falls outside the designated range, and the laboratory performance for that analyte is shown to be in control in the LCSD where applicable, the result is judged to be matrix biased. If no LCSD is present, the associated MS and MSD are to be re-analyzed to determine if any analytical has occurred. If the resulting RPDs are still outside control limits, the result for that analyte in the unfortified sample is labeled suspect/matrix to inform the data user that the results are suspect due to matrix effects.

## 9.8 Initial Calibration Verification (ICV)

- 9.8.1 As part of the IDC (Sect. 13.2), and after each ICAL, analyze a QCS sample from a source different from the source of the CAL standards. If a second vendor is not available, then a different lot of the standard should be used. The QCS should be prepared and analyzed just like a CCV. Acceptance criteria for the QCS are identical to the CCVs; the calculated amount for each analyte must be  $\pm 30\%$  of the expected value. If measured analyte concentrations are not of acceptable accuracy, check the entire analytical procedure to locate and correct the problem.

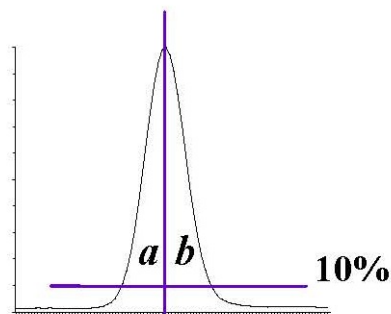


## 9.9 Continuing Calibration Verification (CCV)

9.9.1 CCV Standards are analyzed at the beginning of each analysis batch, after every 10 Field Samples, and at the end of the analysis batch. See Section 10.7 for concentration requirements and acceptance criteria.

## 9.10 Method-specific Quality Control Samples

9.10.1 PEAK ASYMMETRY FACTOR – A peak asymmetry factor must be calculated using the equation below during the IDL and every time a calibration curve is generated. The peak asymmetry factor for the first two eluting peaks in a midlevel CAL standard (if only two analytes are being analyzed, both must be evaluated) must fall in the range of 0.8 to 1.5. Modifying the standard or extract composition to more aqueous content to prevent poor shape is not permitted. See guidance in Section 10.6.4.1 if the calculated peak asymmetry factors do not meet the criteria.



$$A_s = b / a$$

Where:

$A_s$  = peak asymmetry factor

$b$  = width of the back half of the peak measured (at 10% peak height) from the trailing edge of the peak to a line dropped perpendicularly from the peak apex

$a$  = the width of the front half of the peak measured (at 10% peak height) from the leading edge of the peak to a line dropped perpendicularly from the apex.

## 9.11 Method Sequence

- CCV-LOW
- MB
- LCS
- LCSD
- MS
- Duplicate or MSD
- Field Samples (1-10)
- CCV-MID
- Field Samples (11-20)
- CCV-LOW

## 10. Procedure

### 10.1 Equipment Set-up

- 10.1.1** This procedure may be performed manually or in an automated mode using a robotic or automatic sample preparation device. If an automated system is used to prepare samples, follow the manufacturer's operating instructions, but all extraction and elution steps must be the same as in the manual procedure. Extraction and/or elution steps may not be changed or omitted to accommodate the use of an automated system. If an automated system is used, the MBs should be rotated among the ports to ensure that all the valves and tubing meet the MB requirements (Sect. 9.2).
- 10.1.2** Some of the PFAS's adsorb to surfaces, including polypropylene. Therefore, the aqueous sample bottles must be rinsed with the elution solvent (Sect 10.3.4) whether extractions are performed manually or by automation. The bottle rinse is passed through the cartridge to elute the method analytes and is then collected (Sect. 10.3.4).
- 10.1.3 NOTE:** The SPE cartridges and sample bottles described in this section are designed as single use items and should be discarded after use. They may not be refurbished for reuse in subsequent analyses.

### 10.2 Sample Preparation and Extraction of Aqueous Samples

- 10.2.1** Samples are preserved, collected and stored as presented in Section 6.

The entire sample that is received must be sent through the SPE cartridge. In addition, the bottle must be solvent rinsed and this rinse must be sent through the SPE cartridge as well. The method blank (MB) and laboratory control sample (LCS) must be extracted in exactly the same manner (i.e., must include the bottle solvent rinse). It should be noted that a water rinse alone is not sufficient. This does not apply to samples with high concentrations of PFAS that are prepared using serial dilution and not SPE.

- 10.2.2** Determine sample volume. Weigh all samples to the nearest 1g. If visible sediment is present, centrifuge and decant into a new 250mL HDPE bottle and record the weight of the new container.
- NOTE: Some of the PFAS's adsorb to surfaces, thus the sample volume may **NOT** be transferred to a graduated cylinder for volume measurement.
- 10.2.3** The MB, LCS and FRB may be prepared by measuring 250 mL of reagent water with a polypropylene graduated cylinder or filling a 250-mL sample bottle to near the top.
- 10.2.4** Adjust the QC and sample pH to 3 by adding acetic acid in water dropwise
- 10.2.5** Add 20 µL of the EIS PDS (Sect. 8.2.2) to each sample and QC, cap and invert to mix.
- 10.2.6** If the sample is an LCS, LCSD, MS, or MSD, add the necessary amount of analyte PDS (Sect. 8.2.3). Cap and invert each sample to mix.

### 10.3 Cartridge SPE Procedure

- 10.3.1** CARTRIDGE CLEAN-UP AND CONDITIONING – DO NOT allow cartridge packing material to go dry during any of the conditioning steps. Rinse each cartridge with 3 X 5 mL of 2% ammonium hydroxide in methanol, followed by 5mls of methanol. Next, rinse each cartridge with 5 mls of the 25 mM acetate buffer, followed by 15 mL of reagent water, without allowing the water to drop below the top edge of the packing. If the cartridge goes dry during the conditioning phase, the conditioning must be started over. Add 4-5 mL of reagent water to each cartridge, attach the sample transfer tubes (Sect. 7.9.3), turn on the vacuum, and begin adding sample to the cartridge.
- 10.3.2** SAMPLE EXTRACTON – Adjust the vacuum so that the approximate flow rate is approximately 4 mL/min. Do not allow the cartridge to go dry before all the sample has passed through.
- 10.3.3** SAMPLE BOTTLE AND CARTRIDGE RINSE – After the entire sample has passed through the cartridge, rinse the sample bottles with 4 ml reagent water followed by 4 ml 25 mM acetate buffer at pH 4 and draw the aliquot through the sample transfer tubes and the cartridges. Draw air or nitrogen through the cartridge for 5-10 min at high vacuum (10-15 in. Hg). NOTE: If empty plastic reservoirs are used in place of the sample transfer tubes to pass the samples through the cartridges, these reservoirs must be treated like the transfer tubes. After the entire sample has passed through the cartridge, the reservoirs must be rinsed to waste with reagent water.
- 10.3.4** SAMPLE BOTTLE AND CARTRIDGE ELUTION, Fraction 1 – Turn off and release the vacuum. Lift the extraction manifold top and insert a rack with collection tubes into the extraction tank to collect the extracts as they are eluted from the cartridges. Rinse the sample bottles with 12 mls of methanol and draw the aliquot through the sample transfer tubes and cartridges. Use a low vacuum such that the solvent exits the cartridge in a dropwise fashion.

SAMPLE BOTTLE AND CARTRIDGE ELUTION, Fraction 2 In a separate collection vial, rinse the sample bottles with 12 mL of 2% ammonium hydroxide in methanol and elute the analytes from the cartridges by pulling the 4 mL of methanol through the sample transfer tubes and the cartridges. Use a low vacuum such that the solvent exits the cartridge in a dropwise fashion.

NOTE: If empty plastic reservoirs are used in place of the sample transfer tubes to pass the samples through the cartridges, these reservoirs must be treated like the transfer tubes. After the reservoirs have been rinsed in Section 10.3.3, the elution solvent used to rinse the sample bottles must be swirled down the sides of the reservoirs while eluting the cartridge to ensure that any method analytes on the surface of the reservoirs are transferred to the extract.

CLEAN-UP CARTRIDGE ELUTION, Elute the clean-up cartridge with 8 additional mls of methanol and draw the aliquot through the cartridge. Use a low vacuum such that the solvent exits the cartridge in a dropwise fashion.

- 10.3.5** Fractions 1 and 2 are to be combined during the concentration stage (section10.6).

#### 10.4 Sample Prep and Extraction Protocol for Soils, Solids and Sediments.

- 10.4.1 Homogenize and weigh 4 grams of sample (measured to the nearest hundredth of a gram) into a 50 ml polypropylene centrifuge tube. For laboratory control blanks and spikes, 4 grams of clean sand is used.
- 10.4.2 Add 40 µL of the EIS PDS (Sect. 8.2.2) to each sample and QC.
- 10.4.3 If the sample is an LCS, LCSD, MS, or MSD, add the necessary amount of analyte PDS (Sect. 8.2.3). Cap and invert each sample to mix.
- 10.4.4 To all samples, add 10 mls of methanol, cap, vortex for 25 seconds at 2500 RPM.
- 10.4.5 Following mixing, sonicate each sample for 30 minutes and let samples sit overnight (at least 2 hours is required for RUSH samples).
- 10.4.6 Centrifuge each sample at 3500RPM for 10 minutes.
- 10.4.7 Remove 5ml of supernatant, and reserve for clean-up.

#### 10.5 Sample Prep and Extraction Protocol for Tissues, Oils and Biosolids.

- 10.5.1 Homogenize and weigh 2-8 grams of sample (measured to the nearest hundredth of a gram) into a 50 ml polypropylene centrifuge tube. For laboratory control blanks and spikes, 4 grams of clean sand is used.
- 10.5.2 Add 40 µL of the EIS PDS (Sect. 8.2.2) to each sample and QC.
- 10.5.3 If the sample is an LCS, LCSD, MS, or MSD, add the necessary amount of analyte PDS (Sect. 8.2.3). Cap and invert each sample to mix.
- 10.5.4 Add 100 ul of Ammonium Hydroxide.
- 10.5.5 To all samples, add 10 mls of methanol, cap, vortex for 25-30 seconds at 2500 RPM.
- 10.5.6 Following mixing, sonicate each sample for 30 minutes and let samples sit for 2 hours.
- 10.5.7 Centrifuge each sample at 3500RPM for 10 minutes.
- 10.5.8 Remove 5 mls of the supernatant, and reserve for clean-up.

#### 10.6 Extract Clean-up: Soils, Solids and Aqueous Matrices

- 10.6.1 CARTRIDGE CLEAN-UP AND CONDITIONING – Rinse each cartridge with 15 mL of methanol and discard. If the cartridge goes dry during the conditioning phase, the conditioning must be started over. Attach the sample transfer tubes (Sect. 7.9.3), turn on the vacuum, and begin adding sample to the cartridge. For Soils extracts, transfer 5 mls of the MeOH eluate to the cartridge. Samples should be allowed to pass through the cartridge by gravity feed at a dropwise rate to ensure adequate contact time with the cartridge sorbent. Vacuum is only to applied if the flow of solvent through the cartridge stops.
- 10.6.2 Adjust the vacuum so that the approximate flow rate is 1-2 mL/min. Do not allow the cartridge to go dry before all the sample has passed through.
- 10.6.3 SAMPLE BOTTLE AND CARTRIDGE RINSE – After the entire sample has passed through the cartridge, rinse the sample collection vial with two 4-mL aliquots of methanol and draw each aliquot through the cartridges. Draw air or nitrogen through the cartridge for 5 min at high vacuum (10-15 in. Hg).

- 10.6.4 If extracts are not to be immediately evaporated, cover collection tubes and store at ambient temperature till concentration.

### 10.7 Extract Clean-up: Tissues, Oils and Biosolids

- 10.7.1 CARTRIDGE CLEAN-UP AND CONDITIONING – Stack a 500 mg WAX cartridge onto a 250 mg GCB cartridge. Rinse each cartridge set with 10 mL of 2% NH<sub>4</sub>OH and discard. Immediately rinse each cartridge stack with 15 mL MeOH and discard. If the cartridge goes dry during the conditioning phase, the conditioning must be started over. Attach the sample transfer tubes (Sect. 7.9.3), turn on the vacuum.
- 10.7.2 Adjust the vacuum so that the approximate flow rate is 1-2 mL/min. Do not allow the cartridge to go dry before all the sample has passed through.
- 10.7.3 SAMPLE elution AND CARTRIDGE RINSE – Load 5 mL of the MeOH sample extract to the cartridge. After the entire sample has passed through the cartridge, rinse the cartridges with 5-mLs of methanol and draw through the cartridges. Immediately add and elute 2 5mL aliquots of 2% NH<sub>4</sub>OH to the cartridges, collecting the eluate with the MeOH eluate.

If extracts are not to be immediately evaporated, cover collection tubes and store at ambient temperature till concentration.

### 10.8 Extract Concentration

- 10.8.1 Concentrate the extract to dryness under a gentle stream of nitrogen in a heated water bath (60-65 °C) to remove all the water/methanol mix. Add the appropriate amount of 80:20% (vol/vol) methanol:water solution and 20 µL of the ID REC PDS (Sect. 8.2.7) to the collection vial to bring the volume to 1 mL and vortex. Transfer two aliquots with a plastic pipet (Sect. 7.6) into 2 polypropylene autosampler vials.

NOTE: It is recommended that the entire 1-mL aliquot not be transferred to the autosampler vial because the polypropylene autosampler caps do not reseal after injection. Therefore, do not store the extracts in the autosampler vials as evaporation losses can occur occasionally in these autosampler vials. Extracts can be split between 2 X 700 µL vials (Sect. 7.4).

### 10.9 Sample Volume Determination

- 10.9.1 If the level of the sample was marked on the sample bottle, use a graduated cylinder to measure the volume of water required to fill the original sample bottle to the mark made prior to extraction. Determine to the nearest 10 mL.
- 10.9.2 If using weight to determine volume, weigh the empty bottle to the nearest 10 g and determine the sample weight by subtraction of the empty bottle weight from the original sample weight (Sect. 10.2.2). Assume a sample density of 1.0 g/mL. In either case, the sample volume will be used in the final calculations of the analyte concentration (Sect. 11.2).

- 10.10 Initial Calibration - Demonstration and documentation of acceptable initial calibration is required before any samples are analyzed. After the initial calibration is successful, a CCV is required at the beginning and end of each period in which analyses are performed, and after every tenth Field Sample.

#### 10.10.1 ESI-MS/MS TUNE

**10.10.1.1** Calibrate the mass scale of the MS with the calibration compounds and procedures prescribed by the manufacturer.

**10.10.1.2** Optimize the [M-H]<sup>-</sup> for each method analyte by infusing approximately 0.5-1.0 µg/mL of each analyte (prepared in the initial mobile phase conditions) directly into the MS at the chosen LC mobile phase flow rate (approximately 0.4 mL/min). This tune can be done on a mix of the method analytes. The MS parameters (voltages, temperatures, gas flows, etc.) are varied until optimal analyte responses are determined. The method analytes may have different optima requiring some compromise between the optima.

**10.10.1.3** Optimize the product ion for each analyte by infusing approximately 0.5-1.0 µg/mL of each analyte (prepared in the initial mobile phase conditions) directly into the MS at the chosen LC mobile phase flow rate (approximately 0.4 mL/min). This tune can be done on a mix of the method analytes. The MS/MS parameters (collision gas pressure, collision energy, etc.) are varied until optimal analyte responses are determined. Typically, the carboxylic acids have very similar MS/MS conditions and the sulfonic acids have similar MS/MS conditions.

**10.10.2** Establish LC operating parameters that optimize resolution and peak shape. Modifying the standard or extract composition to more aqueous content to prevent poor shape is not permitted.

**Cautions:** LC system components, as well as the mobile phase constituents, contain many of the method analytes in this method. Thus, these PFAS's will build up on the head of the LC column during mobile phase equilibration. To minimize the background PFAS peaks and to keep background levels constant, the time the LC column sits at initial conditions must be kept constant and as short as possible (while ensuring reproducible retention times). In addition, prior to daily use, flush the column with 100% methanol for at least 20 min before initiating a sequence. It may be necessary on some systems to flush other LC components such as wash syringes, sample needles or any other system components before daily use.

**10.10.3** Inject a mid-level CAL standard under LC/MS conditions to obtain the retention times of each method analyte. If analyzing for PFTA, ensure that the LC conditions are adequate to prevent co-elution of PFTA and the mobile phase interferants. These interferants have the same precursor and products ions as PFTA, and under faster LC conditions may co-elute with PFTA. Divide the chromatogram into retention time windows each of which contains one or more chromatographic peaks. During MS/MS analysis, fragment a small number of selected precursor ions ([M-H]<sup>-</sup>) for the analytes in each window and choose the most abundant product ion. For maximum sensitivity, small mass windows of ±0.5 daltons around the product ion mass were used for quantitation.

**10.10.4** Inject a mid-level CAL standard under optimized LC/MS/MS conditions to ensure that each method analyte is observed in its MS/MS window and that there are at least 10 scans across the peak for optimum precision.

**10.10.4.1** If broad, split or fronting peaks are observed for the first two eluting chromatographic peaks (if only two analytes are being analyzed, both must be evaluated), change the initial mobile phase conditions to higher

aqueous content until the peak asymmetry ratio for each peak is 0.8 – 1.5. The peak asymmetry factor is calculated as described in Section 9.9.1 on a mid-level CAL standard. The peak asymmetry factor must meet the above criteria for the first two eluting peaks during the IDL and every time a new calibration curve is generated. Modifying the standard or extract composition to more aqueous content to prevent poor shape is not permitted.

NOTE: PFHxS, PFOS, NMeFOSAA, and NEtFOSAA have multiple chromatographic peaks using the LC conditions in Table 5 due to chromatographic resolution of the linear and branched isomers of these compounds. Most PFAS's are produced by two different processes. One process gives rise to linear PFAS's only while the other process produces both linear and branched isomers. Thus, both branched and linear PFAS's can potentially be found in the environment. For the aforementioned compounds that give rise to more than one peak, all the chromatographic peaks observed in the standard must be integrated and the areas totaled. Chromatographic peaks in a sample must be integrated in the same way as the CAL standard.

**10.10.5** Prepare a set of CAL standards as described in Section 8.2.5. The lowest concentration CAL standard must be at or below the RL (2 ng/L), which may depend on system sensitivity.

**10.10.6** The LC/MS/MS system is calibrated using the isotope dilution technique. Target analytes are quantitated against their isotopically labeled analog (Extracted Internal Standard) where commercially available. If a labeled analog is not commercially available, the extracted internal standard with the closest retention time and /or closest chemical similarity is to be used. Use the LC/MS/MS data system software to generate a linear regression or quadratic calibration curve for each of the analytes. This curve must always be forced through zero and may be concentration weighted, if necessary. Forcing zero allows for a better estimate of the background levels of method analytes. A minimum of 5 levels are required for a linear calibration model and a minimum of 6 levels are required for a quadratic calibration model.

**10.10.7 CALIBRATION ACCEPTANCE CRITERIA** – A linear fit is acceptable if the coefficient of determination ( $r^2$ ) is greater than 0.99. When quantitated using the initial calibration curve, each calibration point, except the lowest point, for each analyte must calculate to be within 70-130% of its true value. The lowest CAL point must calculate to be within 50-150% of its true value. If these criteria cannot be met, the analyst will have difficulty meeting ongoing QC criteria. It is recommended that corrective action is taken to reanalyze the CAL standards, restrict the range of calibration, or select an alternate method of calibration (forcing the curve through zero is still required).

**10.10.7.1 CAUTION:** When acquiring MS/MS data, LC operating conditions must be carefully reproduced for each analysis to provide reproducible retention times. If this is not done, the correct ions will not be monitored at the appropriate times. As a precautionary measure, the chromatographic peaks in each window must not elute too close to the edge of the segment time window.

**10.11 CONTINUING CALIBRATION CHECK (CCV)** – Minimum daily calibration verification is as follows. Verify the initial calibration at the beginning and end of each group of analyses, and after every tenth sample during analyses. In this context, a “sample” is considered to be a Field Sample. MBs, CCVs, LCSs, MSs, FDs FRBs and MSDs are not counted as samples. The beginning CCV of each analysis batch must be at or below the RL in order to verify instrument sensitivity prior to any analyses. If standards have been prepared such that all low CAL points are not in the same CAL solution, it may be necessary to analyze two CAL standards to meet this requirement. Alternatively, the analyte concentrations in the analyte PDS may be customized to meet these criteria. Subsequent CCVs should alternate between a medium and Low concentration CAL standard.

**10.11.1** Inject an aliquot of the appropriate concentration CAL standard and analyze with the same conditions used during the initial calibration.

**10.11.2** Calculate the concentration of each analyte and EIS in the CCV. The calculated amount for each analyte for medium level CCVs must be within  $\pm 30\%$  of the true value with an allowance of 10% of the reported analytes to be greater than 30%. The calculated amount for each EIS must be within  $\pm 50\%$  of the true value. The calculated amount for the lowest calibration point for each analyte must be within  $\pm 50\%$ . If these conditions do not exist, then all data for the problem analyte must be considered invalid, and remedial action should be taken (Sect. 10.7.4) which may require recalibration. Any Field or QC Samples that have been analyzed since the last acceptable calibration verification should be reanalyzed after adequate calibration has been restored, with the following exception. If the CCV fails because the calculated concentration is greater than 130% (150% for the low-level CCV) for a particular method analyte, and Field Sample extracts show no detection for that method analyte, non-detects may be reported without re-analysis.

**10.11.3** REMEDIAL ACTION – Failure to meet CCV QC performance criteria may require remedial action. Major maintenance, such as cleaning the electrospray probe, atmospheric pressure ionization source, cleaning the mass analyzer, replacing the LC column, etc., requires recalibration (Sect 10.6) and verification of sensitivity by analyzing a CCV at or below the RL (Sect 10.7).

## 10.12 EXTRACT ANALYSIS

**10.12.1** Establish operating conditions equivalent to those summarized in Tables 6-8 of Section 16. Instrument conditions and columns should be optimized prior to the initiation of the IDC.

**10.12.2** Establish an appropriate retention time window for each analyte. This should be based on measurements of actual retention time variation for each method analyte in CAL standard solutions analyzed on the LC over the course of time. A value of plus or minus three times the standard deviation of the retention time obtained for each method analyte while establishing the initial calibration and completing the IDC can be used to calculate a suggested window size. However, the experience of the analyst should weigh heavily on the determination of the appropriate retention window size.

**10.12.3** Calibrate the system by either the analysis of a calibration curve (Sect. 10.6) or by confirming the initial calibration is still valid by analyzing a CCV as described



in Section 10.7. If establishing an initial calibration, complete the IDC as described in Section 13.2.

- 10.12.4** Begin analyzing Field Samples, including QC samples, at their appropriate frequency by injecting the same size aliquots under the same conditions used to analyze the CAL standards.
- 10.12.5** At the conclusion of data acquisition, use the same software that was used in the calibration procedure to identify peaks of interest in predetermined retention time windows. Use the data system software to examine the ion abundances of the peaks in the chromatogram. Identify an analyte by comparison of its retention time with that of the corresponding method analyte peak in a reference standard.
- 10.12.6** The analyst must not extrapolate beyond the established calibration range. If an analyte peak area exceeds the range of the initial calibration curve, the sample should be re-extracted with a reduced sample volume in order to bring the out of range target analytes into the calibration range. If a smaller sample size would not be representative of the entire sample, the following options are recommended. Re-extract an additional aliquot of sufficient size to insure that it is representative of the entire sample. Spike it with a higher concentration of internal standard. Prior to LC/MS analysis, dilute the sample so that it has a concentration of internal standard equivalent to that present in the calibration standard. Then, analyze the diluted extract.

## 11. Data Evaluation, Calculations and Reporting

- 11.1** Complete chromatographic resolution is not necessary for accurate and precise measurements of analyte concentrations using MS/MS. In validating this method, concentrations were calculated by measuring the product ions listed in Table 7.
- 11.2** Calculate analyte concentrations using the multipoint calibration established in Section 10.6. Do not use daily calibration verification data to quantitate analytes in samples. Adjust final analyte concentrations to reflect the actual sample volume determined in Section 10.6 where:

$$C_{ex} = (\text{Area of target analyte} * \text{Concentration of Labeled analog}) / (\text{area of labeled analog} * \text{CF})$$

$$C_s = (C_{ex} / \text{sample volume in ml}) * 1000$$

$C_{ex}$  = The concentration of the analyte in the extract

CF = calibration factor from calibration.

- 11.3** Prior to reporting the data, the chromatogram should be reviewed for any incorrect peak identification or poor integration.
- 11.4** PFHxS, PFOS, PFOA, NMeFOSAA, and NEtFOSAA have multiple chromatographic peaks using the LC conditions in Table 5 due to the linear and branch isomers of these compounds (Sect. 10.6.4.1). The areas of all the linear and branched isomer peaks observed in the CAL standards for each of these analytes must be summed and the concentrations reported as a total for each of these analytes.

- 11.5** Calculations must utilize all available digits of precision, but final reported concentrations should be rounded to an appropriate number of significant figures (one digit of uncertainty), typically two, and not more than three significant figures.

## 12. Contingencies for Handling Out-of-Control Data or Unacceptable Data

- 12.1** Section 9.0 outlines sample batch QC acceptance criteria. If non-compliant organic compound results are to be reported, the Organic Section Head and/or the Laboratory Director, and the Operations Manager must approve the reporting of these results. The laboratory Project Manager shall be notified, and may choose to relay the non-compliance to the client, for approval, or other corrective action, such as re-sampling and re-analysis. The analyst, Data Reviewer, or Department Supervisor performing the secondary review initiates the project narrative, and the narrative must clearly document the non-compliance and provide a reason for acceptance of these results.
- 12.2** All results for the organic compounds of interest are reportable without qualification if extraction and analytical holding times are met, preservation requirements (including cooler temperatures) are met, all QC criteria are met, and matrix interference is not suspected during extraction or analysis of the samples. If any of the below QC parameters are not met, all associated samples must be evaluated for re-extraction and/or re-analysis.

## 13. Method Performance

### 13.1 Detection Limit Study (DL) / Limit of Detection Study (LOD) / Limit of Quantitation (LOQ)

- 13.1.1** The laboratory follows the procedure to determine the DL, LOD, and/or LOQ as outlined in Alpha SOP ID 1732. These studies performed by the laboratory are maintained on file for review.

### 13.2 Demonstration of Capability Studies

- 13.2.1** The IDC must be successfully performed prior to analyzing any Field Samples. Prior to conducting the IDC, the analyst must first generate an acceptable Initial Calibration following the procedure outlined in Section 10.6.
- 13.2.2** INITIAL DEMONSTRATION OF LOW SYSTEM BACKGROUND – Any time a new lot of SPE cartridges, solvents, centrifuge tubes, disposable pipets, and autosampler vials are used, it must be demonstrated that an MB is reasonably free of contamination and that the criteria in Section 9.2.1 are met. If an automated extraction system is used, an MB should be extracted on each port to ensure that all the valves and tubing are free from potential PFAS contamination.
- 13.2.3** INITIAL DEMONSTRATION OF PRECISION (IDP) – Prepare, extract, and analyze four to seven replicate LCSs fortified near the midrange of the initial calibration curve according to the procedure described in Section 10. Sample preservatives as described in Section 6.2.1 must be added to these samples. The relative standard deviation (RSD) of the results of the replicate analyses must be less than 20%.

- 13.2.4** INITIAL DEMONSTRATION OF ACCURACY (IDA) – Using the same set of replicate data generated for Section 13.2.3, calculate average recovery. The average recovery of the replicate values must be within  $\pm 30\%$  of the true value.
- 13.2.5** INITIAL DEMONSTRATION OF PEAK ASYMMETRY FACTOR – Peak asymmetry factors must be calculated using the equation in Section 9.10.1 for the first two eluting peaks (if only two analytes are being analyzed, both must be evaluated) in a mid-level CAL standard. The peak asymmetry factors must fall in the range of 0.8 to 1.5. See guidance in Section 10.6.4.1 if the calculated peak asymmetry factors do not meet the criteria.
- 13.2.6** Refer to Alpha SOP ID 1739 for further information regarding IDC/DOC Generation.
- 13.2.7** The analyst must make a continuing, annual, demonstration of the ability to generate acceptable accuracy and precision with this method.

## 14. Pollution Prevention and Waste Management

- 14.1** Refer to Alpha's Chemical Hygiene Plan and Hazardous Waste Management and Disposal SOP for further pollution prevention and waste management information.
- 14.2** This method utilizes SPE to extract analytes from water. It requires the use of very small volumes of organic solvent and very small quantities of pure analytes, thereby minimizing the potential hazards to both the analyst and the environment as compared to the use of large volumes of organic solvents in conventional liquid-liquid extractions.
- 14.3** The analytical procedures described in this method generate relatively small amounts of waste since only small amounts of reagents and solvents are used. The matrices of concern are finished drinking water or source water. However, laboratory waste management practices must be conducted consistent with all applicable rules and regulations, and that laboratories protect the air, water, and land by minimizing and controlling all releases from fume hoods and bench operations. Also, compliance is required with any sewage discharge permits and regulations, particularly the hazardous waste identification rules and land disposal restrictions.

## 15. Referenced Documents

Chemical Hygiene Plan – ID 2124  
SOP ID 1732 Detection Limit (DL), Limit of Detection (LOD) & Limit of Quantitation (LOQ) SOP  
SOP ID 1739 Demonstration of Capability (DOC) Generation SOP  
SOP ID 1728 Hazardous Waste Management and Disposal SOP

## 16. Attachments

**Table 7: LC Method Conditions**

Time (min)	2 mM Ammonium Acetate (5:95 MeOH/H <sub>2</sub> O)	100% Methanol
Initial	100.0	0.0
1.0	100.0	0.0
2.2	85.0	15.0
11	20.0	80.0
11.4	0.0	100.0
12.4	100.0	00.0
15.5	100.0	0.0
Waters Aquity UPLC ® BEHC <sub>18</sub> 2.1 x 50 mm packed with 1.7 µm BEH C <sub>18</sub> stationary phase Flow rate of 0.4 mL/min 3 µL injection		

**Table 8: ESI-MS Method Conditions**

ESI Conditions	
Polarity	Negative ion
Capillary needle voltage	.5 kV
Cone Gas Flow	25 L/hr
Nitrogen desolvation gas	1000 L/hr
Desolvation gas temp.	500 °C

**Table 9: Method Analyte Source, Retention Times (RTs), and EIS References**

#	Analyte	Transition	RT	IS	Type
1	M3PBA	216>171	2.65		REC
2	PFBA	213 > 169	2.65	2: M4PFBA	
3	M4PFBA	217 > 172	2.65	1: M3PBA	EIS
4	PFPeA	263 > 219	5.67	4: M5PFPEA	
5	M5PFPEA	268 > 223	5.66	1: M3PBA	EIS
6	PFBS	299 > 80	6.35	6: M3PFBS	
7	M3PFBS	302 > 80	6.35	29:M4PFOS	EIS
8	FtS 4:2	327 > 307	7.47	9: M2-4:2FtS	
9	M2-4:2FtS	329 > 81	7.47	29:M4PFOS	EIS
10	PfHxA	303 > 269	7.57	10: M5PFHxA	
11	M5PFHxA	318 > 273	7.57	19:M2PFOA	EIS
12	PFPeS	349 > 80	7.88	18: M3PFHxS	
13	PfHpA	363 > 319	8.80	14: M4PFHpA	
14	M4PFHpA	367 > 322	8.80	19:M2PFOA	EIS

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#	Analyte	Transition	RT	IS	Type
15	L-PFHxS	399 > 80	8.94	18: M3PFHxS	
16	br-PFHxS	399 > 80	8.72	18: M3PFHxS	
17	PFHxS Total	399 > 80	8.94	18: M3PFHxS	
18	M3PFHxS	402 > 80	8.94	29:M4PFOS	EIS
19	MPFOA	415 > 370	9.7		REC
20	PFOA	413 > 369	9.7	23: M8PFOA	
21	br-PFOA	413 > 369	9.48	23: M8PFOA	
22	PFOA Total	413 > 369	9.7	23: M8PFOA	
23	M8PFOA	421 > 376	9.7	19: M2PFOA	EIS
24	FtS 6:2	427 > 407	9.66	25: M2-6:2FtS	
25	M2-6:2FtS	429 > 409	9.66	29:M4PFOS	EIS
26	PFHpS	449 > 80	9.78	33: M8PFOS	
27	PFNA	463 > 419	10.41	33: M8PFOS	
28	M9PFNA	472 > 427	10.41	19: M2PFOA	EIS
29	M4PFOS	501 > 80	10.45		REC
30	PFOS	499 > 80	10.45	33: M8PFOS	
31	br-PFOS	499 > 80	10.27	33: M8PFOS	
32	PFOS Total	499 > 80	10.45	33: M8PFOS	
33	M8PFOS	507 > 80	10.45	29: M4PFOS	EIS
34	FtS 8:2	527 > 507	10.99	38: M2-8:2FtS	
35	M2-8:2FtS	529 > 509	10.99	29:M4PFOS	EIS
36	M2PFDA	515 > 470	11.00		REC
37	PFDA	513 > 469	11.00	38: M6PFDA	
38	M6PFDA	519 > 474	11.00	36: M2PFDA	EIS
39	PFNS	549 > 80	11.02	33:M8PFOS	
40	NMeFOSAA	570 > 419	11.41	41: D3-NMeFOSAA	
41	d3-NMeFOSAA	573 > 419	11.41	36: M2PFDA	EIS
42	PFOSA	498 > 78	11.48	29: M8FOSA	
43	M8FOSA	506 > 78	11.48	19: M2PFOA	EIS
44	PFUnDA	563 > 519	11.51	41: M7-PFUdA	
45	M7-PFUdA	570 > 525	11.51	36: M2PFDA	EIS
46	PFDS	599 > 80	11.51	33:M8PFOS	
47	NEtFOSAA	584 > 419	11.68	48: d5-NEtFOSAA	
48	d5-NEtFOSAA	589 > 419	11.68	36: M2PFDA	EIS
49	PFDOA	613 > 569	11.96	50: MPFDOA	
50	MPFDOA	615 > 570	11.96	36: M2PFDA	EIS
51	PFTriA	663 > 619	12.34	50: MPFDOA	
52	PFTeA	713 > 669	12.6	53: M2PFTEDA	
53	M2PFTEDA	715 > 670	12.6	36: M2PFDA	EIS

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#	Analyte	Transition	RT	IS	Type
54	M3HFPO-DA	329>285	7.97	19: M2PFOA	EIS
55	HFPO-DA	332>287	7.97	54: M3HFPO-DA	
56	ADONA	377>251	8.00	23: M8PFOA	
57	PFHxDA	813>769	13.20	59: M2PFHxDA	
58	PFODA	913>869	13.50	59: M2PFHxDA	
59	M2PFHxDA	815>770	13.20	36: M2PFDA	EIS
60	NEtFOSA	526>169	11.00	61: NMeFOSA	
61	NMeFOSA	512>169	10.50	63: d3-NMeFOSA	
62	d3-NMeFOSA	515>169	10.50	36: M2PFDA	EIS
63	d5-NEtFOSA	531>169	11.00	36: M2PFDA	EIS
64	NMeFOSE	556>122	11.25	66: d7-NMeFOSE	
65	NEtFOSE	570>136	10.75	67: d9-NEtFOSE	
66	d7-NMeFOSE	563>126	11.25	36: M2PFDA	EIS
67	d9-NEtFOSE	579>142	10.75	36: M2PFDA	EIS
68	FtS 10:2	627>607	11.50	25: M2-6:2FTS	
69	PFDoS	699>99	12.50	33: M8PFOS	
70	9CIPF3ONS	531>351	10.23	33: M8PFOS	
10	11CIPF3OUdS	631>451	11.27	33: M8PFOS	

**Appendix G:**  
Third Party Data Validator



RESUME  
STELLA S. CUENCO

EDUCATION

B.S. Chemistry, 1991  
University of the Philippines (UP)

PROFESSIONAL HISTORY

Laboratory Data Consultants, Inc.  
Senior Chemist  
1996 to present

Ceimic Corporation  
GC/MS Chemist  
1996

Analytical Technologies, Inc.  
GC/MS VOA Group Leader  
1992 to 1996

Analytical Technologies, Inc.  
GC/MS Chemist  
1991 to 1992

Natural Products Research, UP  
Research Assistant  
1990 to 1991

REPRESENTATIVE EXPERIENCE

Ms. Cuenco has over 27 years combined environmental laboratory and data validation experience. Her experience includes performance of data validation in the GC and GC/MS areas for major Federal projects. She has performed large validation projects under Boeing, Navy Southwest, Northwest and Pacific Division, EPA Region IX ESAT, USACE and AFCEE/AFCEC programs. Her laboratory experience includes hands-on CLP and EPA analysis of GC and GC/MS volatile organic compounds.

Specifically, Ms. Cuenco has over 22 years organic data validation experience using USEPA (including Region III) functional guidelines and other applicable documents.

- As senior chemist with LDC, Ms. Cuenco specializes in the data validation and contract compliance screening of gas chromatography-mass spectrometry analyses as well as gas chromatography analyses. She has a thorough knowledge and understanding of gas chromatography and gas chromatography-mass spectrometry (GCMS) and high resolution GCMS methods referenced in EPA CLP, SW-846, EPA 500, 600 and 1600 series documents. She has performed large data validation under Boeing, Navy Southwest and Pacific Divisions and EPA Region IX ESAT, USACE and AFCEE/AFCEC projects.





Ms. Cuenco has over 5 years experience in an environmental laboratory performing the analysis of organic parameters.

- As GC/MS chemist at Ceimic Corporation, a full service environmental analytical chemistry facility, Ms. Cuenco performed GC and GC/MS volatile analyses. She was responsible for the final reporting of analytical data for this section.
- As GC/MS VOA Group Leader at Analytical Technologies Inc., a full service environmental analytical chemistry facility, Ms. Cuenco was responsible for all GC/MS functions which included overseeing daily operations, training staff, final reporting of analytical data, and compliance with method requirements.
- As research assistant at Natural Products Research, UP, Ms. Cuenco researched chemical literature for plants with known medicinal properties as well as performed microbiological and pharmacological tests on plant extracts.



RESUME  
PEI GENG

EDUCATION

M.S. Organic Chemistry, 1989  
Sam Houston State University

B.S. Environmental Chemistry, 1983  
Nankai University

PROFESSIONAL HISTORY

Laboratory Data Consultants, Inc.  
Senior Chemist  
1997 to present

Ceimic Corporation  
GC/MS and GC Chemist  
1996 to 1997

PACE Analytical Service Inc.  
GC/MS and GC Chemist  
1990 to 1996

REPRESENTATIVE EXPERIENCE

Ms. Geng has over 28 years combined environmental laboratory and data validation experience. Her experience includes performance of data validation in the GC and GC/MS areas for major Federal projects. She has performed large validation projects under Boeing, Navy Southwest, Northwest and Pacific Division, EPA Region IX ESAT, USACE and AFCEE/AFCEC programs. Her laboratory experience includes hands-on CLP and EPA analysis of GC and GC/MS volatile organic compounds.

Specifically, Ms. Geng has over 21 years organic data validation experience using USEPA CLP (including Region III) functional guidelines and other applicable documents.

- As chemist with LDC, Ms. Geng specializes in the data validation and contract compliance screening of gas chromatography-mass spectrometry analyses as well as gas chromatography analyses. She has a thorough knowledge and understanding of gas chromatography and gas chromatography-mass spectrometry (GCMS) and high resolution GCMS methods referenced in EPA CLP, SW-846, EPA 500, 600 and 1600 series documents. She has performed large data validation under Boeing, Navy Southwest and Pacific Divisions and EPA Region IX ESAT, USACE and AFCEE/AFCEC projects.



Ms. Geng has over 7 years of experience in an environmental laboratory performing the analysis of organic parameters.

- As both a GC and GC/MS chemist at Ceimic Corporation, a full service environmental analytical chemistry facility, Ms. Geng performed GC and GC/MS volatile and semivolatile analyses.
- As both a GC and GC/MS chemist at PACE Analytical Service Inc., a full service environmental analytical chemistry facility, Ms. Geng performed GC and GC/MS volatile and semivolatile analyses as well as overseeing the final reporting of analytical data, and compliance with method requirements.



RESUME  
RICHARD M. AMANO

EDUCATION

B.S. Biochemistry  
University of California, Los Angeles, 1979

A.A. Chemistry  
El Camino College, 1977

PROFESSIONAL HISTORY

Laboratory Data Consultants, Inc.  
Program Manager/Principal Scientist  
2011-present  
President/Principal Chemist,  
1991 to 2011

Analytical Technologies, Inc  
Laboratory Director  
1986 to 1991

Brown & Caldwell  
Laboratory Supervisor  
1983 to 1986

West Coast Technical Service  
Senior Chemist  
1980 to 1983

University of California, Los Angeles  
Laboratory Technician  
1979 to 1980

REPRESENTATIVE EXPERIENCE

Mr. Amano has over 38 years of combined environmental laboratory, QA/QC, laboratory auditing, data management, environmental software development, and data validation experience. Prior to founding LDC in 1991, he directed two major laboratories, Analytical Technologies, Inc. (San Diego) and Brown and Caldwell. His experience includes oversight and direction of major QA/QC and data validation efforts for confidential petroleum spill projects, Boeing sites, Superfund sites, DoE sites, Navy RI/FS projects, Army Corps of Engineers investigations, and AFCEE/AFCEC projects. He has also overseen several laboratory audits for major analytical testing programs and large scale environmental software development for the US Army Corps of Engineers (USACE).

Specifically, Mr. Amano has over 26 years of experience with validation of organic, inorganic, and radiochemical analyses using USEPA, Navy, USACE, DoD, AFCEE/AFCEC, and other applicable guidance documents.



- As program manager/principal scientist with LDC, Mr. Amano provides management and technical support to the data validation, data quality, and software group. He oversees and directs all environmental software projects developed for the USACE. Additionally, he acts as the primary LDC/USACE contract manager for software development projects. He is the primary author of the nationally distributed Automated Data Review (ADR) software used by the USACE, Navy, DTSC, and commercial clients.
- As President/principal chemist with LDC, Mr. Amano provided management and technical support to the data validation, data quality, and software group. He provided technical support in the organic, inorganic, and radiochemical areas. Under several major QA/QC and data validation programs, he provided, as needed, a final review of data validation and assessment reports. Mr. Amano specializes in the evaluation, validation, and interpretation of environmental testing data. Additional responsibilities include laboratory QA/QC and NELAC audits, implementation and support of QA/QC programs and data management support for engineering firms, environmental lab training, consultation on LIMS data base designs for environmental laboratories, and expert witness litigation support. Mr. Amano has managed and directed several major data validation and QA/QC projects for Army Corps, Navy, Air Force, and commercial contracts. Industrial projects include major petroleum oil spill related data validation and assessment of hydrocarbon analyses. The DoD projects include Southwest Division CLEAN 1 (Jacobs Engineering/IT Corporation/CH2M Hill), Southwest Division CLEAN 2 (Bechtel National), Pacific Northwest Division CLEAN (URS Greiner), Southern Division CLEAN (ABB Environmental), Atlantic Division CLEAN (EA Engineering), Southwest Division RAC (OHM Remediation), Pacific Division CLEAN (Earth Tech), AFCEE/AFCEC Mather AFB (Montgomery Watson), AFCEE/AFCEC Pease AFB (Bechtel Environmental), AFCEE/AFCEC England AFB (Law Environmental), Army Corps Travis AFB (CH2M Hill), Army Corps Hawthorne Army Depot (Tetra Tech), Nevada Test Site (IT Corp), and Army Corps Fort Ord (Harding Lawson). He provided oversight and direction for major USACE environmental software development including Automated Data Review (ADR), FUDSFORUM, MRSPP, and FUDSCHEM. He has a thorough knowledge and understanding of EPA CLP, SW-846, EPA 500, EPA 900, and EPA 600 series methods. He additionally has supported attorneys as an expert witness and has taught data integrity and lab ethics courses for several organizations.

Mr. Amano has over 12 years environmental laboratory experience in commercial laboratories supervising or performing the analyses of organic, inorganic, and radiochemical parameters.

- As laboratory director and technical director of Analytical Technologies, Inc, a full service environmental analytical chemistry facility, Mr. Amano was responsible for all facets of operations. These responsibilities include direct technical input for GC, GC/MS, and inorganic operations, personnel selection, assisting in method development, and selection of non-routine analysis. In addition, Mr. Amano was responsible for supervision of the 80 scientists employed at ATI's San Diego laboratory with all group supervisors, quality assurance and safety coordinators reporting directly to him. Mr. Amano has managed numerous analytical testing programs including the North Island Navy Confirmation Study, Miramar Air Force Base Confirmation Study, and investigations at several of the EPA Superfund sites. His environmental expertise focuses on the chemical testing related to hazardous waste investigations, site remediation, and groundwater monitoring programs.



- While at Brown & Caldwell, Mr. Amano's responsibilities encompassed supervision of daily operations of the laboratory, personnel staffing, technical advisor for operation of the gas chromatograph/mass spectrometer (GC/MS) section, maintenance of QA/QC programs, and coordination between engineers, clients, and laboratory analysts. Additionally, he supervised the daily operation of all radiochemistry activities which included alpha, beta, and radium analyses.
- At West Coast Technical Service, Mr. Amano was responsible for daily operation and quality control of the GC/MS group. Mr. Amano was highly involved with the USEPA hazardous waste contracts. Some special projects included dioxin selected ion monitoring analysis, EPA method 624 and 625 validation studies, and low level drinking water evaluations.

### TECHNICAL PRESENTATIONS

#### "Understanding the Workings of an Environmental Laboratory"

Southern California Department of Health Services, 1984  
Hargis & Associates, Inc, La Jolla, CA, 1987  
Hargis & Associates, Inc, Tucson, AZ, 1987  
Westec Services, San Diego, CA, 1987  
Applied Hydrogeologic, Inc, San Diego, CA 1989

#### "Data Validation, QA/QC, and Environmental Analysis"

Van, Waters, and Rogers, Seattle, WA, 1990  
ERC Environmental, Honolulu, HI, 1991  
Harding Lawson Associates, Honolulu, HI, 1991  
Pacific Division Naval Engineering Group, Honolulu, HI, 1991  
OHM, Irvine, CA, 1996  
Southwest Division Naval Engineering Group, San Diego, CA, 1996  
Navy Public Works Center, San Diego, CA 1996

#### "GC versus GC/MS"

J.H. Kleinfelder & Associates, Artesia, CA 1986  
Hargis & Associates, Inc, La Jolla, CA 1987

#### "Analytical Methods and QA/QC Procedures for Environmental Analysis"

County of San Diego Department of Health Services, San Diego, CA 1989  
Regional Water Quality Control Board, San Diego, CA 1990  
ERC Environmental, San Diego, CA 1990  
Mittlehauser Corporation, Laguna Hills, CA 1991

#### "Hydrocarbon Testing Related to Underground Storage Tanks (UST)"

San Diego County DOHS, San Diego, CA, 1986  
J.H. Kleinfelder & Associates, Artesia, CA 1986  
Woodward Clyde Consultants, San Diego, CA 1987

Engineering Enterprises, Long Beach, CA 1987

#### "Quality Control/Quality Assurance in Laboratories"

Assoc of Hazardous Materials Professionals, Anaheim, CA 1986  
R.L. Stollar & Associates, Santa Ana, CA 1989



"The Influence of Sample Matrix on Environmental Analysis"  
Assoc of Hazardous Materials Professionals, San Diego, CA 1990

"Comparison of Air Sampling Media"  
Assoc of Hazardous Materials Professionals, Anaheim, CA 1991

"Building a Second Generation LIMS for Commercial Laboratory Operations"  
Pittsburgh Conference, New York, NY, 1990 (Invited Speaker)

"Employment Outlook in Environmental Laboratories"  
Southern California American Chemical Society, 1985

"Opportunities in the Environmental Lab in the 1990's"  
American Chemical Society, 1990

"Data Validation of Radiochemical Analyses"  
Hargis + Associates, La Jolla, CA 1991

"Detection Limits - MDL, PQL, RDL, LOD ?"  
Analytical Technologies, Inc., 1991

"Poor QA/QC or Laboratory Fraud: Have labs crossed the fine line?"  
Environmental Professionals Organization, Newport Beach, CA 1996

"Electronic Data Deliverables and Automated Data Review/Validation"  
Army Corps of Engineers, Sacramento District, Sacramento, CA 1996

"Navy Environmental Data Transfer Standards"  
Kleinfelder, San Diego, CA 1997

"Laboratory QA/QC Update for DoD Programs"  
ACTLabs, Long Beach, CA 1997

### LECTURING AND TEACHING

"Instrumental Analysis of Hazardous Materials"  
University of California, San Diego 1988 - 1995

"Field Monitoring & Laboratory Analysis of Hazardous Materials"

University of California, San Diego 1995 - 1998

California State Fullerton, Guest Lecturer, 1985 & 1990

San Diego State University, Hydrology Department, Guest Lecturer, 1988

"EPA Level 4 Data Validation" Workshop  
Applied Geotechnology, Inc., Bellevue, WA, 1993

"Environmental Analyses in the 90's"



## **LABORATORY DATA CONSULTANTS, INC.**

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National University, Guest Lecturer, 1993

"Data Quality Objectives for Federal Environmental Programs"  
University of California, San Diego 1993

"Data Integrity and Data Management for Federal Environmental Programs"  
University of California, San Diego 1994

"Laboratory QA/QC and Electronic Data Requirements for DoD Programs"  
University of California, San Diego 1995

"Application and Utilization of Department of Defense (DoD) Guidance Documents"  
University of California, San Diego 1996

"Laboratory Quality Assurance for Department of Defense Programs"  
University of California, San Diego 1997

### PUBLICATIONS

"Managing an Environmental Chemistry Laboratory for Profit",  
John H. Taylor, Jr and Richard M. Amano,  
Journal of Chromatographic Science, 1987

### MEMBERSHIPS AND AFFILIATIONS

American Chemical Society

Association of Hazardous Materials Professionals, (Steering Committee 1988-1994)

Association of California Testing Laboratories, (Board Member 1989-1991)

County of San Diego, Site Assessment and Mitigation Technical Forum (Steering Committee 1990-2000)

American Society Quality Control (1992-2005)

### FOUNDATIONS

Golf for Autistic Children in America (GACA), Founder/President (2011)





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## RESUME ERLINDA T. RAUTO

### EDUCATION

B.S. Chemical Engineering 1967  
Feati University - Manila, Philippines

### PROFESSIONAL HISTORY

Laboratory Data Consultants, Inc.  
Senior Chemist/Validation Group Manager  
1993 to present

Appropriate Technologies, Inc.  
Chemist II  
1992 to 1993

AECOS Inc.  
Laboratory Supervisor  
1989 to 1992

PWCSA #4 County Complex  
Laboratory Analyst  
1986 to 1989

Kalama Specialty Chemical  
Chemist  
1980 to 1982

### REPRESENTATIVE EXPERIENCE

Ms. Rauto has over 38 years combined environmental laboratory, QA/QC, and data validation experience. Her experience includes performance of data validation in the GC, trace metals, and wet chemistry areas for major Federal projects. Her laboratory experience includes hands-on CLP and EPA ICP/GFAA analysis, pesticide/PCBs and wet chemistry analysis.

Specifically, Ms. Rauto has over 25 years of experience with organic data validation and assessment using USEPA (including Region III) functional guidelines and other applicable documents.

- As a Principal chemist with LDC, Ms. Rauto provides management and technical support to the data validation group. She specializes in the data validation and compliance screening of gas chromatography organic analyses. This validation includes EPA CLP, SW-846, and EPA Water and Wastewater methods. Over the past 16 years, Ms. Rauto has performed USEPA Level 3 and Level 4 (including NFESC Level C and D) validation for projects including Boeing SSFL, Southwest Division CLEAN 1 (Jacobs Engineering/IT Corporation/CH2M Hill), Southwest Division CLEAN 2 (Bechtel National), Pacific Northwest Division CLEAN (URS Greiner), Southern Division CLEAN (ABB Environmental), Atlantic Division CLEAN (EA Engineering), Southwest Division RAC (OHM Remediation), Pacific Division CLEAN (Earth Tech), DoE Atomic City (Jacobs



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Engineering Group), Army Corps of Engineers, Travis AFB (CH2M Hill), Army Corps of Engineers, Camp Navajo (Tetra Tech), AFCEE/AFCEC Mather AFB (Montgomery Watson), AFCEE/AFCEC Pease AFB (Bechtel Environmental), AFCEE/AFCEC England AFB (Law Environmental), Army Corps of Engineers, Hawthorne Army Depot (Tetra Tech), Army Corps of Engineers, Fort Ord (Harding Lawson), Nevada Test Site (IT Corp), and AFCEE/AFCEC Beale AFB (Law/Crandall, Inc.).

Ms. Rauto has organic laboratory experience with over 13 years of experience in an environmental laboratory supervising or performing the analyses of organic parameters.

- As a chemist II at Appropriate Technologies, Inc., a hazardous waste disposal facility, Ms. Rauto was responsible for the operation of the gas chromatographs. Organochlorine pesticides and PCBs analysis was the primary method performed. In addition, Ms. Rauto performed ICP analyses for trace metals, as well as, supported engineers in developing waste treatment processes.
- As the laboratory supervisor at AECOS Inc., Ms. Rauto supervised and directed operation of gas chromatography, atomic absorption, and wet chemistry instrumentation. She interfaced with state and federal agencies to maintain certification and developed a written QA/QC plan for the laboratory.
- As chemist at Kalama Specialty Chemical, Ms. Rauto performed gas chromatography analysis on raw materials and finished products. She worked on the research and development of new chemicals.

Additionally, Ms. Rauto has 2 years inorganic/conventional analytical experience.

- While employed at the Prince William County laboratory, Ms. Rauto was involved in the analysis of water and wastewater for metals and wet chemistry parameters. This included BOD, COD, nitrate, nitrite, sulfate, chloride, fluoride, TDS, conductivity, pH, cyanide, and phenols analyses. She maintained the QA/QC program to assure compliance with EPA guidelines.

### AFFILIATIONS

American Society for Quality Control



RESUME  
CHRISTINA RINK-ASHDOWN

EDUCATION

BS Biology, 2006  
University of California, San Diego

PROFESSIONAL HISTORY

Laboratory Data Consultants, Inc.  
Inorganic Chemist  
2009 to present

Enviromatrix Analytical, Inc.  
Metals Chemist  
2007 to 2009

REPRESENTATIVE EXPERIENCE

Ms. Rink-Ashdown has over 11 years combined environmental laboratory and data validation experience. Her experience includes performance of data validation in the trace metals, radiochemistry, and wet chemistry areas for major Federal and commercial projects. Her laboratory experience includes hands-on CLP and SW-846 ICP/CVAA analysis and overall technical review of data deliverables. Specifically, Ms. Rink-Ashdown has over 6 years inorganic and radiochemistry data validation experience using USEPA (including Region III) functional guidelines and other applicable documents.

As chemist with LDC, Ms. Rink-Ashdown specializes in the data validation of trace metals, wet chemistry, methyl mercury and radiochemistry analyses using USEPA functional guidelines or equivalent protocol. She has worked under various CERCLA and EPA data validation guidelines for the various CERCLA, Navy, Army Corps, AFCEE/AFCEC and commercial projects. She is certified as a "Radiometric Data Validation Specialist" through course work and testing by the Radiochemistry Society. **Ms. Rink-Ashdown has validated over 2,000 samples for various isotopes in the last two years.**

Ms. Rink-Ashdown has over 2 years of environmental laboratory experience in a laboratory performing the analyses of inorganic parameters.

As lead inorganic chemist at Enviromatrix Analytical, Inc., Ms. Rink-Ashdown managed the inorganic chemistry section which performed techniques such as atomic absorption and inductively coupled argon plasma spectrometry. These analyses were performed from methods referenced in EPA CLP, SW-846, and Standard Methods documents.



RESUME  
SHAUNA McKELLAR

EDUCATION

B.S. Environmental Toxicology, 2006  
University of California at Davis

PROFESSIONAL HISTORY

Laboratory Data Consultants, Inc.  
Project Manager / Chemist  
May 2010 to present

D-Max Engineering, Inc.  
Assistant Project Scientist  
January 2007 to May 2010

University of California at Davis  
Undergraduate Researcher  
March 2005 to June 2006

REPRESENTATIVE EXPERIENCE

Ms. McKellar has over 14 years combined consulting, field sampling, database management, data validation, and automated data review experience. Her experience includes performance of automated data validation for major Navy Southwest Division, US Army Corps of Engineers, and Alaska DEC projects as well as data management for commercial and litigation projects. Her field sampling experience includes surface water sampling in both wet and dry weather conditions, and her laboratory experience includes preparation and analysis of samples utilizing HPLC and UV-vis spectrometry, instrument maintenance, and data evaluation.

Specifically, Ms. McKellar has over 6 years of inorganic and organic data validation experience using USEPA functional guidelines, Navy procedures, QAPP, ADEC checklists, and other applicable documents, in addition to more than 3 years of experience working in the environmental compliance field, and over one year working in a research laboratory.

- As chemist with LDC, Ms. McKellar specializes in the data validation and contract compliance screening using LDC's Automated Data Review (ADR) software, and is familiar with a variety of different Electronic Data Deliverable formats, including SEDD and NEDD. She has supervised large data validation projects under the USACE and Navy Southwest Division RAC contracts.
- As an assistant project scientist with D-Max Engineering, Ms. McKellar performed wet and dry weather surface water sampling related to compliance with Regional Water Quality Control Board NPDES Permits. She also maintained large project databases related to stormwater inspection and monitoring programs for various municipalities.



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- As an undergraduate researcher at the University of California at Davis, Ms. McKellar conducted an independent atmospheric chemistry research project utilizing HPLC and UV-Vis spectroscopy. She was responsible for the instrument calibration, verifying sample analyses, and routine instrument maintenance.



RESUME  
LINDA TA

EDUCATION

B.S. Geology, 2012  
California State University Long Beach

PROFESSIONAL HISTORY

Laboratory Data Consultants, Inc.  
Chemist and Project Manager  
July 2018 to present

Eurofins Calscience  
Project Manager Assistant  
02/2014-07/2018

Eurofins Calscience  
Chemist  
10/2013-02/2014

REPRESENTATIVE EXPERIENCE

Although Ms. Ta has less than one year of experience at LDC, she is proficient in data validation for GC and GCMS methods for Level II and III.

- As a project manager with LDC, Ms. Ta assists the other project managers through project set-up, validation, report review, and writing project data quality assessment reports. Ms. Ta is also in training to perform ADR validation and ERPIMS database tasks. She is also the administrative support specialist for LDC Advantage secure data sharing portal where she assists with project and client set-up.

Ms. Ta has 5 years of experience in an environmental laboratory performing the analysis of organic parameters.

- As a GC/MS chemist at Eurofins Calscience, a full service environmental analytical chemistry facility, Ms. Ta performed GC/MS volatile analyses using various EPA Methods in accordance with standard operating procedures. Ms. Ta utilized Agilent Chemstation and Laboratory Information Management Systems (LIMS) to analyze and report data.
- As a Project Manager Assistant at Eurofins Calscience, Ms. Ta assisted multiple Project Managers to oversee all laboratory functions for various projects. In addition, she managed several minor projects for various Environmental consultants. She served as the secondary point of contact for clients, ensured that Chain of Custodies are accurate and analyses are logged in correctly, directed preparation of bottle orders, scheduled pickups and deliveries, coordinated subcontracted analyses, provided quality control review of project-related documents and compliance to project criteria, worked closely with lab group supervisors and executive managers in planning new projects and managed ongoing analytical work. Ms. Ta evaluated analytical data, prepared project



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case narratives and summaries, compiled laboratory reports for external validation, and worked closely with chemists and lab group supervisors in resolving quality assurance and quality control issues. She prepared detailed project billing and generated multiple Electronic Data Deliverables. She was also responsible for training new Project Manager Assistants on various PM tasks, data review and compilation of laboratory Level III/IV QC Data Deliverables.

Below is a partial listing of clients and projects which Ms. Ta has assisted:

- Department of Defense Sites

- Edwards AFB
- George AFB
- Vandenberg AFB

- SSFL NASA

- BP/ARCO

- Aerospace Company

Below is a listing of various database management software which Ms. Ta has extensive training on:

- ERPIMS

- EQUIS

- Envirodata

- NEDD

- ADR

- Geotracker



### **Relevant Project Experience**

LDC has performed data validation and Quality Assurance services for contaminated sites overseen by AFCEE/AFCEC, Navy Southwest Division, DoE, DoD, EPA Superfund projects overseen by EPA Regions II, III, IV, IX, X, USACE projects reviewed by the Alaska, Baltimore, Louisville, Albuquerque, Seattle, Philadelphia, and Sacramento Districts, and Navy projects reviewed by NFESC.

LDC is the software developer and expert in the use of the Automated Data Review (ADR) software. LDC has been using the ADR.NET version for over 2 years and has the current Version in full implementation. LDC has performed over 1000 ADR projects in the past 10 years' worth over \$2,000,000 in revenue. ADR clients include, but are not limited to: Tetra Tech EC, Sealaska, AMEC, EPA, California DTSC, MWH, Trevet, Brown & Caldwell, AECOM, Shaw, ITSI, CDM, Weston Solutions and the San Gabriel Watermaster.

LDC has validated over 1,000,000 samples for analyses such as volatile organics (CLP, EPA Method 8240/8260), semivolatile organics (CLP, EPA Method 8270), organochlorine pesticides/PCBs (CLP, EPA Method 8081/8082), chlorinated herbicides (EPA Method 8151), purgeable halocarbons and aromatics (EPA Method 8021), trace metals (CLP, EPA Method 6010/6020/7000), PAHs by EPA 8310 and 8270, TOC analyses, hexavalent chromium, total petroleum hydrocarbons (EPA Method 8015/CDOHS LUFT), radiochemical constituents including gross alpha/beta, alpha spec, gamma spec, tritium, and uranium, and general minerals.

LDC has met their contractual turnaround time and quality requirements on over 99% of the projects completed.





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## Project References/Experience

Name and Address, Contact Person, Telephone	Work Description and Location	Requested Deliverables	Number of samples/ Matrix	Value (\$)	Start/Stop
Washington State Department of Transportation Environmental Services Office P.O. Box 47332 Olympia, WA 98504 ATTN: Mr. Brad Archbold ArchboB@wsdot.wa.gov 360-570-6636	WSDOT NPDES Stormwater Monitoring LDC performed Stage 2A, 2B and 4 data validation for a full suite of analyses including GCMS, GC, Metals, and Wet Chemistry analyses.	Stage 2A, 2B, and 4 data validation reports. Work conducted under Washington State Department of Transportation Stormwater Monitoring	>3,800 Soil and Water	\$48,332	04/2013-07/2016
Leighton Consulting, Inc. 17781 Cowan Irvine, CA 92614 ATTN: Mr. Mark Withrow mwithrow@leightongroup.com cell: 949-394-2194 office: 949-681-4211	San Onofre Nuclear Generating Station (SONGS) Mesa Facility LDC performed EPA Level III and IV equivalent data validation for a full suite of analyses. Analyses included GCMS, GC, Metals, and Wet Chemistry analyses.	EPA Level III and IV data validation reports. Work conducted under USEPA Contract Laboratory Program National Functional Guidelines (CLPNFG).	>3,600 Soil, Water, and Air	\$66,225	09/2015-present
Leighton Consulting, Inc. 17781 Cowan Irvine, CA 92614 ATTN: Ms. Julie Harriman jharriman@leightongroup.com Direct : (949) 681-4264 Cell: (949) 572-8129	Aliso Canyon LDC performed EPA Level II equivalent data validation. Analyses included VOA, SVOA, Total Hydrocarbons, Isopropyl Alcohol, Total Dust, and Sulfur Compounds.	EPA Level II data validation reports and PARCC summary report. Work conducted under USEPA Contract Laboratory Program National Functional Guidelines (CLPNFG).	>1,200 Air, Wipe, and Disk	\$15,749	07/2016-08/2016
Tetra Tech, EM Inc. 1999 Harrison Street, Suite 500 Oakland, CA 94612 ATTN: Ms. Sara Woolley Sara.Woolley@tetratech.com Direct: 510.302.6311 Main: 510.302.6300	Subcontract 161408 For Various project sites including: EAGLE NEST INVESTIGATION FORT IRWIN GOLD BEACH MILL HPNS MARE ISLAND MOTCO LITIGATION NAF EL CENTRO NWS CONCORD LDC performed Cursory and Full data validation for a full suite of analyses using specified EPA Guidelines, DoD QSM Version 4.2, and Tetra Tech EMI, Inc. validation documents.	TTEMI Format data validation reports and EDD using Tetra Tech's validate program.	>3000 Soil and Water	\$39,785	10/2011 – 10/2013



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Name and Address, Contact Person, Telephone	Work Description and Location	Requested Deliverables	Number of samples/ Matrix	Value (\$)	Start/Stop
GEI Consultants, Inc. 455 Winding Brook Drive Glastonbury, CT 06033 (860) 368-5342 direct (860) 368-5300 main Jaimie Wargo JWargo@geiconsultants.com	Various NYSDEC sites LDC performed Category B equivalent data validation Analyses included: VOC, SVOC, Pesticide, PCB, Herbicide, Steroids, Metals, Wet Chemistry	Category B data validation and NYSDEC DUSR reports	>1,700 Soil and Water	\$72,000	2010-present
TetraTech EC 17885 Von Karman Ave, Suite 500 Irvine, CA 92614 Attn: Lisa Bienkowski (949) 809-5028 Lisa.Bienkowski@tetrattech.com	Tetra Tech Hunter's Point CA LDC performed EPA Level III and IV equivalent data validation for a full suite of analyses on more than 50,000 soil and water samples. Analyses included tritium, isotopic thorium, uranium and plutonium, and gross alpha/beta. Expedited turnaround times were included (5 day TAT)	EPA Level III and IV data validation reports. Work conducted under US Navy RAC program, Southwest Div.	>50,000 Soil and Water	\$645,733	02/2001-present
AECOM (Earth Tech) 700 Bishop Street Honolulu, HI 96813 Contact: Scott Lewis (808) 523-8874 Scott.Lewis@aecom.com	Data validation per EPA level "3/C" and "4/D" guidelines for volatile organic, semivolatile organic, pesticides/PCBs, herbicides, phenols, phosphorus pesticides, dioxin, radiochemical, and trace metal analyses in soil, water, and tissue matrices. (Navy PACDIV CLEAN, Honolulu, HI)	LDC worksheets and validation reports	>10,000 samples Water/Soil/Air	\$750,000	4/98-present
CBI (formerly Shaw E&I) 3347 Michelson Drive, Ste 200 Irvine, CA 92612 Contact: Mr. Dwayne Ishida Phone: (949) 660-7561 <a href="mailto:Dwayne.Ishida@CBIFederalServices.com">Dwayne.Ishida@CBIFederalServices.com</a>	Data validation per EPA level "3" and "4" and AFCEE/AFCEC guidelines for volatile organic, semivolatile organic, pesticides/PCBs, herbicides, phenols, phosphorus pesticides, dioxin, radiochemical, and trace metal analyses in soil, water, and tissue matrices. (Navy Southwest Division RAC, San Diego, CA and various AFCEE/AFCEC projects)	LDC worksheets and validation reports	>5000 samples Water/Soil/Air	\$350,000	6/06-present



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Name and Address, Contact Person, Telephone	Work Description and Location	Requested Deliverables	Number of samples/ Matrix	Value (\$)	Start/Stop
Santa Clara Pueblo Office of Environmental Affairs 578 Kee Street Española, New Mexico, 87532 Ms. Ernestine Naranjo 505-692-6270 phone 505-747-2728 fax enaranjo@santaclarapueblo.org	Data validation per EPA level "III" SCP-OEA-DEPO, Data Validation using ADR For full suite of Organic, Inorganic, and Radiochemical analyses. Radiochemical analyses including Gross alpha & beta, Gamma Spectroscopy, Iodine, Radium-226/228, Strontium-90, Isotopic Pu, Th, and U, Tritium, and Americium by various EPA and GA methods.	Level III validation using ADR	>750 Soil, Water, and Air	\$11,987.05	12/2015 - present
Anchor Environmental, LLC 720 Olive Way, Suite 1900 Seattle, WA 98101 Ms. Joy Dunay 206.287.9130, jdunay@anchorqea.com	Data validation per Level "C" Newtown Creek Phase 2: Third Party Data Validation of laboratory results, EDD population, and Data Quality Assessment Reports (DQAR) for various methods Subcontractor	LDC worksheets and validation reports	>63,000 Soil and Water	\$743,793.88	6/14-1/16
Tradebe Environmental Services, LLC. 628 South Saratoga Street Cohoes, NY 12047 Attn: Accounts Payable Mr. Tom VanVranken (518) 235-0401 tom.vanvranken@tradebe.com	Norlite MACT Project LDC performed Category B equivalent data validation Analyses included: Metals, Mercury, Heat Content, Ash Content, Chlorine, Density, and Dioxins	Category B data validation and NYSDEC DUSR reports	11 Soil, Air and Water	\$2,000.00	9/2013
P.W.Grosser Consulting2015 630 Johnson Ave, Suite 7 Bohemia, NY 11716 Attn: Mr. Derek Ersbak w. 631.589.6353 f. 631.589.8705 dereke@pwgrosser.com	Former Arkansas Chemical Co.Site and Former Ronkonkoma Wallpaper Site 203 Jay St. LDC performed Category B equivalent data validation Analyses included: VOC, SVOC, Pesticide, PCB, Metals, Wet Chemistry	Category B data validation and NYSDEC DUSR reports	>200 Soil and Water	\$3,024.00	11/2014-present



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<b>Name and Address, Contact Person, Telephone</b>	<b>Work Description and Location</b>	<b>Requested Deliverables</b>	<b>Number of samples/ Matrix</b>	<b>Value (\$)</b>	<b>Start/Stop</b>
Amec Foster Wheeler Environment and Infrastructure, Inc. 9210 Sky Park Court, Suite 200 San Diego, CA 92123 Attn: Mr. Rolf Schottle rolf.schottle@amecfw.com Tel +1 (858) 300 4300, Fax +1 (858) 300 4301, Direct +1 (858) 300 4323	Regional Harbor Monitoring Program (RHMP), San Diego, California Third party validation of LDC performed EPA Level III and IV equivalent data validation for a full suite of analyses.	LDC worksheets and validation reports	>200 Water	\$9,011.40	3/15-6/16

Note: All above projects were 100% self-performed by LDC

# Appendix 8

## Site Management Forms

Site Management Forms  
NYSDEC BCP #C224329



IMPACT ENVIRONMENTAL  
170 Keyland Court  
Bohemia, New York 11716  
TEL: (631) 268-8800  
FAX: (631) 269-1599

## ENGINEERING CONTROLS ANNUAL INSPECTION REPORT - 2023

Prepared By: \_\_\_\_\_

WEATHER	Snow	Rain	Overcast	Partly Cloudy	Bright Sun
TEMP.	< 32	32-50	50-70	70-85	>85

<b>NYSDEC #</b>	CC224329	<b>Date:</b>
<b>Project Name:</b>	585 Union Street, Brooklyn, NY	

<b>Environmental Consultant:</b> Impact Environmental Engineering and Geology PLLC (IEEG) Xin Yuan, P.E. New York Professional Engineer License No. # 096444	<b>Property Manager:</b>
-----------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------

**Inspection Narrative:**

Pursuant to the Site Management Plan (SMP) Environmental Engineering and Geology, PLLC (IEEG) conducted an inspection of the employed Engineering Control (EC) installed to ensure permanent protection of public health from residual materials remaining on site on \_\_\_\_\_. This site has one (1) Engineering Control System:

- Composite Cover System:
  - The Composite Cover System is comprised of a minimum 10-inch thick concrete building slab that covers the entirety of the site footprint. The concrete slab is underlain by Stego Industries Inc. 20-mil Stego Wrap® vapor barrier with the exception of the elevator pit and the exterior sidewalls along Union Street and along 3rd Avenue where Grace PrePrufe® waterproofing membrane was installed.

Note: While not part of the engineering control system the buildings ventilation system was also inspected:

- Sub-grade Garage Ventilation System: Although not identified as an engineering control, a mechanical ventilation system designed for the sub-grade parking garage will control sub-grade airflow below the first floor/ground level occupied space. The parking garage mechanical system at the Site will evacuate vapors/gases that collect from vehicles in the garage space at 21,000 CFM and 5.6 air change per hour. This system will provide an air break beneath the at-grade, street level retail spaces, utility rooms, detention tank, rest rooms, residential tenant bike storage room, residential tenant mail and package rooms, leasing office and the residential lobby to access residential units starting on the second floor.

An Inspection Photo Log has been attached illustrating the condition of the Engineering Control deployed at 585 Union Street



**Photo Log**

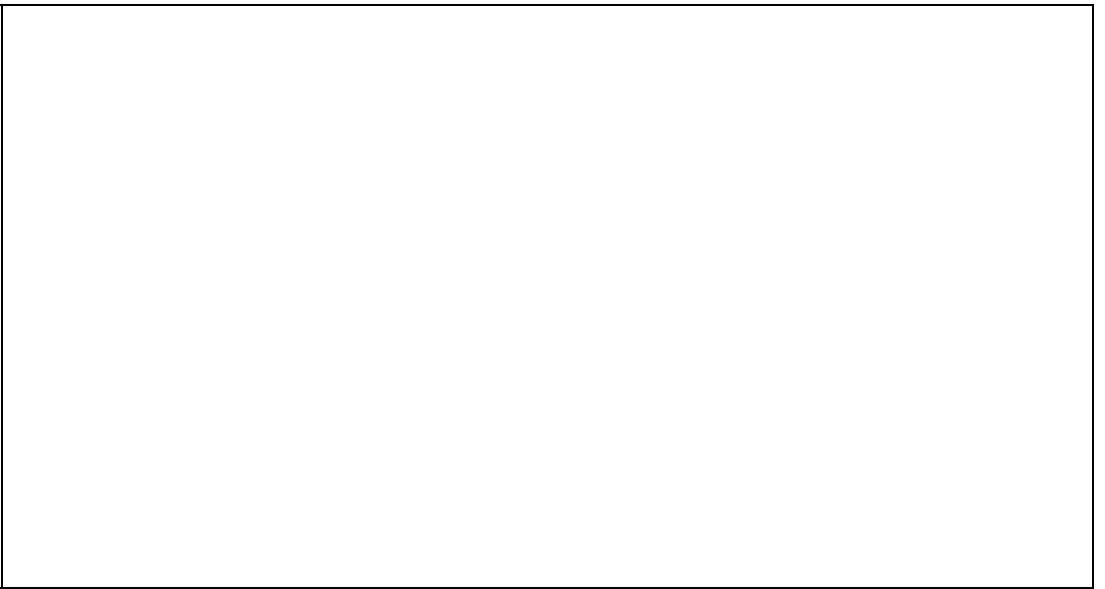
**Photo 1 –**

**Photo 2 –**

**Photo 3 –**



**Photo 4 –**



**Photo 5 –**

**Photo 6 –**

**Photo 7 –**

**Photo 8 –**

**Photo 9 –**

**Photo 10 –**