



November 2025  
Former Nepera Plant Site, Harriman, New York



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# Groundwater Mercury Sampling Work Plan

Prepared for Nepera, Inc. and Warner-Lambert Company, LLC (Corporate Defendants) and  
ELT Harriman, LLC

November 2025

Former Nepera Plant Site, Harriman, New York

# Groundwater Mercury Sampling Work Plan

**Prepared for**

Nepera, Inc.  
Warner-Lambert Company, LLC  
ELT Harriman, LLC

**Prepared by**

Anchor QEA  
68 Excelsior Avenue, Suite 101  
Saratoga Springs, New York 12866

## Certification Page

I, Timothy I. DiGiulio, certify that I am currently a New York State-registered professional engineer as defined in 6 NYCRR Part 375 and that this Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the Division of Environmental Remediation Technical Guidance for Site Investigation and Remediation (DER-10) and DER Green Remediation (DER-31).



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Timothy I. DiGiulio, PE

New York PE License No. 068151

Anchor QEA, LLC

Date: November 3, 2025



## Certification Page

I, Jeffery R. Caputi, certify that I am currently a New York State-registered professional engineer as defined in 6 NYCRR Part 375 and that this Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the Division of Environmental Remediation Technical Guidance for Site Investigation and Remediation (DER-10) and DER Green Remediation (DER-31).



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Jeffery R. Caputi, PE

New York PE License No. 082196

Brown and Caldwell Associates

Date: November 3, 2025





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## ABBREVIATIONS

|        |                                                         |
|--------|---------------------------------------------------------|
| EPA    | U.S. Environmental Protection Agency                    |
| FS     | Feasibility Study                                       |
| HASP   | Health and Safety Plan                                  |
| ISMP   | Interim Site Management Plan                            |
| NYSDEC | New York State Department of Environmental Conservation |
| QAPP   | Quality Assurance Project Plan                          |

# 1 Background and Objectives

Anchor QEA is submitting this Groundwater Mercury Sampling Work Plan as part of the remediation of the Former Nepera Harriman Site in Harriman, New York (Site No. 336006). The objective of this proposed scope of work is to collect groundwater samples for use in the upcoming Feasibility Study (FS) evaluations and in the associated documents that will be prepared for the Site.

Many investigations conducted since the issuance of the Record of Decision (ROD; NYSDEC 1997) and before and after remedial measures were taken to address groundwater impacts at the Site have defined the nature and extent of the groundwater contamination. But with few exceptions<sup>1</sup>, the data for mercury in the Site's groundwater is limited to samples collected in 1991. As a result of improvements in groundwater collection methods (e.g., low-flow methodology) and changes in Site conditions over 30+ years, the available data on mercury in groundwater across most of the Site will be re-evaluated.

To develop an up-to-date set of data for mercury in groundwater, this Work Plan includes the collection of 18 groundwater samples from existing wells screened in the aquifer and aquitard around the perimeter of the Site, as outlined in Figure 1. This effort will supplement the 2023 and 2025 groundwater data collection in the parking lot area as part of the ISMP and provide data that better represent current conditions. This sampling effort will also provide greater coverage to evaluate the potential for groundwater impacts from Site soils, including the potential for residual contamination to leach into the groundwater, as well as provide information to support an updated conceptual site model as part of the upcoming FS documents for the Site.

## 2 Scope of Work

### 2.1 Groundwater Sampling and Methods

Groundwater samples will be collected from 18 wells screened in the overburden aquifer. These wells are near the perimeter of the Site and will supplement the four wells sampled for mercury as part of the ISMP. Figure 1 shows the proposed wells to be sampled for this effort and the wells sampled for mercury in March 2025 as part of the routine groundwater monitoring program. Table 1 also lists the wells to be sampled, the laboratory method, and the sampling rationale. All activities will be performed in accordance with the approved ISMP that was submitted to the New York State Department of Environmental Conservation (NYSDEC) on April 15, 2025. The results of this sampling will supplement the currently available mercury data that will be evaluated as part of the FS for the Site.

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<sup>1</sup> —Data taken consistently from well MW-24S at the northern corner of the Site and from select wells around the parking lot during execution of the Interim Site Management Plan (ISMP; Brown and Caldwell and Anchor QEA 2025) sampling in 2023 and 2025.

As shown in Figure 1 and Table 1, several of the wells targeted for sampling have not been sampled for at least 15 years. Therefore, repair and redevelopment needs were assessed and well maintenance work was completed in October 2025. Figure 2 shows the wells that were redeveloped and/or repaired as part of this field effort. No additional repair or redevelopment efforts are needed at this time.

Groundwater samples will be collected using the low-flow methods outlined in the Quality Assurance Project Plan (QAPP) in Appendix A, which was originally submitted as ISMP Appendix F. One exception is that we will consider using a peristaltic pump for groundwater extraction in place of a bladder pump.

## 2.2 Analytical Testing

Eurofins US Laboratories will complete the analysis of mercury concentrations for this effort using U.S. Environmental Protection Agency (EPA) Method 7470A, as outlined in the QAPP.

## 3 Health and Safety

All the health and safety procedures specified in the Health and Safety Plan (HASP) will be followed. The HASP, which is provided in Appendix B hereto, was originally submitted as Appendix C of the ISMP.

## 4 Data Usability, Validation, and Reporting

Quality assurance sampling and data validation will follow the procedures in the QAPP. During sample collection, groundwater mercury samples will be subject to field duplication at a frequency of 1 per 20 samples. Samples will also be subject to blank, matrix spike, and matrix spike duplicates at the same frequency of 1 per 20 samples. Validation will be conducted as specified in the QAPP. In accordance with the ISMP, a Data Usability Summary Report will be prepared following validation of the analytical data and submitted to the Agency for review and approval and an electronic data deliverable containing the data will be uploaded to the NYSDEC EQuIS system.

## 5 Project Schedule

The work is anticipated to require 2 to 3 days to complete and is currently projected for November 2025, contingent on the timeline for NYSDEC review and approval. In compliance with the ISMP, the NYSDEC will be notified at least 5 business days in advance of the sampling event.

## 6 References

Brown and Caldwell and Anchor QEA (Brown and Caldwell Associates and Anchor QEA), 2025. *Interim Site Management Plan*. NYSDEC Site Number: 336006. USEPA ID No. NYD002014595. Former

Nepera Plant Site, Harriman, New York. Prepared for Nepera, Inc., and Warner-Lambert Company, LLC (Corporate Defendants) and ELT Harriman, LLC. April 2025.

NYSDEC (New York State Department of Environmental Conservation), 1997. Nepera, Inc. – Harriman Inactive Hazardous Waste Site. Harriman, Orange County. Site No. 336006. Record of Decision. March 1997.

# Table

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**Table 1**  
**Proposed Groundwater Sampling Locations**

| Well ID | Water Bearing Unit | Last Sampled (Year) | Analytical Parameters | Laboratory Method <sup>a,b</sup> | Sampling Rationale       |
|---------|--------------------|---------------------|-----------------------|----------------------------------|--------------------------|
| AMW-1   | Aquifer            | 2025                | Mercury               | EPA 7470A                        | Support Remedy Selection |
| AMW-2   | Aquifer            | 2023                | Mercury               | EPA 7470A                        | Support Remedy Selection |
| MW-2S   | Aquifer            | 1991                | Mercury               | EPA 7470A                        | Support Remedy Selection |
| MW-5S   | Aquifer            | 2025                | Mercury               | EPA 7470A                        | Support Remedy Selection |
| MW-7S   | Aquifer            | 2025                | Mercury               | EPA 7470A                        | Support Remedy Selection |
| MW-9S   | Aquifer            | 2025                | Mercury               | EPA 7470A                        | Support Remedy Selection |
| MW-12S  | Aquifer            | 2025                | Mercury               | EPA 7470A                        | Support Remedy Selection |
| MW-21S  | Aquifer            | 2008                | Mercury               | EPA 7470A                        | Support Remedy Selection |
| MW-26S  | Aquifer            | 2023                | Mercury               | EPA 7470A                        | Support Remedy Selection |
| MW-27S  | Aquifer            | 1991                | Mercury               | EPA 7470A                        | Support Remedy Selection |
| MW-28S  | Aquifer            | 2006                | Mercury               | EPA 7470A                        | Support Remedy Selection |
| MW-29S  | Aquifer            | 2006                | Mercury               | EPA 7470A                        | Support Remedy Selection |
| MW-106  | Aquifer            | 2025                | Mercury               | EPA 7470A                        | Support Remedy Selection |
| MW-201  | Aquifer            | 2025                | Mercury               | EPA 7470A                        | Support Remedy Selection |
| MW-202S | Aquifer            | 2025                | Mercury               | EPA 7470A                        | Support Remedy Selection |
| OW-6    | Aquifer            | 2025                | Mercury               | EPA 7470A                        | Support Remedy Selection |
| PZ-1    | Aquifer            | 2008                | Mercury               | EPA 7470A                        | Support Remedy Selection |
| PZ-4    | Aquifer            | 2008                | Mercury               | EPA 7470A                        | Support Remedy Selection |

Notes:

a. EPA Method 7470A has a published method detection limit (MDL) of 0.0910 µg/L and method reporting limit (MRL) of 0.200 µg/L.

Actual MDLs and MRLs may vary based on sample aliquot size and required dilution factor.

b. Field duplicate, laboratory duplicate, and field blank samples will be collected at a frequency of 1 per 20 samples.

µg: microgram

EPA: U.S. Environmental Protection Agency

## Figures

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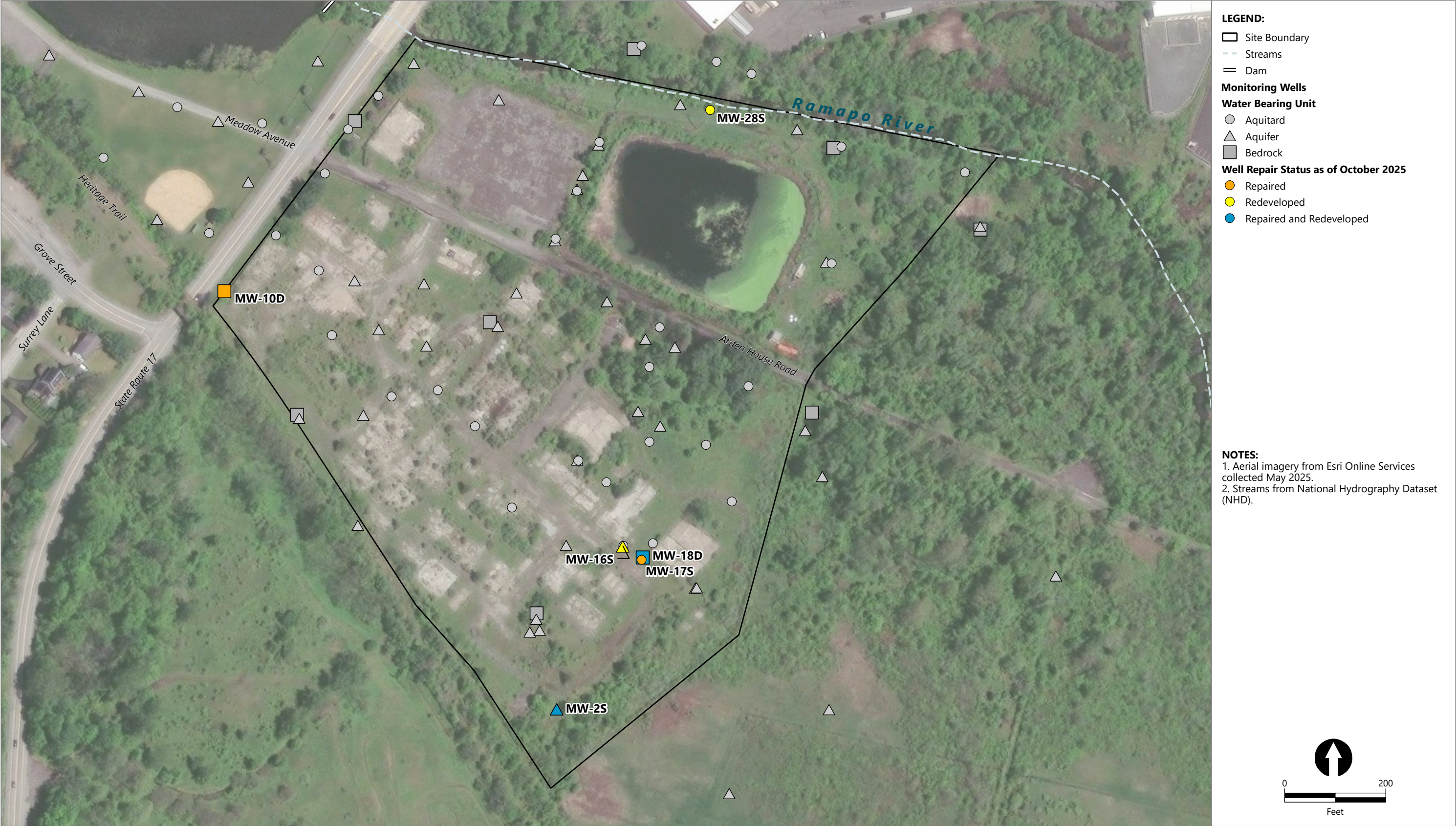


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Filepath: \\gstfile01\gis\Jobs\Nepera\_3099\Maps\GroundwaterMonitoring\MercurySampling\_WorkPlan\Nepera\_Mercury\_WP.aprx | AQ\_Nepera\_MercuryWP\_Fig01\_ProposedWellSampling



**Figure 1**  
**Proposed Wells for Mercury Groundwater Sampling**  
Groundwater Mercury Sampling Work Plan  
Former Nepera Plant Site, Harriman, New York





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**Figure 2**  
**Wells Redeveloped or Repaired, October 2025**  
Groundwater Mercury Sampling Work Plan  
Former Nepera Plant Site, Harriman, New York



## Appendix A

### Quality Assurance Project Plan

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# Nepera Inc. - Harriman Site Quality Assurance Project Plan INTERIM SITE MANAGEMENT PLAN

April 15, 2025

## PREPARED FOR

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ELT Harriman, LLC  
and  
Nepera, Inc. & Warner-Lambert Company  
(Corporate Defendants)

## PRESENTED BY

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Anchor QEA, LLC  
68 Excelsior Ave, Suite 101  
Saratoga Springs, New York 12866

## A. PROJECT MANAGEMENT

### A.1 APPROVAL/ACCEPTANCE SHEET



Tim DiGiulio, P.E.  
N.Y.P.E. License Number  
P.E. of Record

April 15, 2025  
DATE



Matt Beaupre  
Project Quality Assurance Officer

April 15, 2025  
DATE

#### Harriman QAPP Update Log

| Prepared/Revised By: | Date:    | Revision No: | Summary of Changes:                                                                    |
|----------------------|----------|--------------|----------------------------------------------------------------------------------------|
| Sarah LaRoe          | 2/1/2025 | 1            | Addition of 5 wells for routine sampling. Removal of nitrate requirement for analysis. |
|                      |          |              |                                                                                        |
|                      |          |              |                                                                                        |
|                      |          |              |                                                                                        |
|                      |          |              |                                                                                        |
|                      |          |              |                                                                                        |

## A.2 DISTRIBUTION LIST

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The following individuals are to receive a copy of the approved QAPP including any revisions in order to complete their role in this project.

| Name             | Title                           | Organization       | Document type |
|------------------|---------------------------------|--------------------|---------------|
| Tim Johnson      | Project Manager                 | Anchor QEA         | Electronic    |
| Jeff Caputi, PE  | Project Manager, P.E. of Record | Brown and Caldwell | Electronic    |
| Tim DiGiulio, PE | P.E. of Record                  | Anchor QEA         | Electronic    |

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## B. PROJECT/TASK ORGANIZATION

The QAPP applies to the aspects of the project associated with the collection of field data, the collection and analytical laboratory testing of field samples and QA/QC samples, and the evaluation of the quality of the data that is generated. Groundwater monitoring will be conducted that involves analytical laboratory testing of groundwater samples and the collection of groundwater quality measurements.

The key individuals involved with the QAPP are as follows:

Tim Johnson, Project Manager

1. Oversee project administration, including budget, scheduling and procurement of materials required for successful implementation of this project
2. Oversee coordination of interactions with NYSDEC, NYSDOH, and ELT
3. Determine project strategy and overall design, including site location, parameter selection, sampling frequency, etc.
4. Ensure all individuals involved in this project have the proper training to fulfill their assigned role and understand and follow the protocols as detailed in this QAPP

Matt Beaupre, Quality Assurance Officer

1. Ensure field procedures, analytical methods, and quality assurance/quality control requirements are consistent with project objectives and are clearly documented in the QAPP.
2. Maintain the official approved QAPP and any subsequent revisions.

Caroline Jalanti, NYSDEC Project Manager

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E-mail address: [caroline.jalanti@dec.ny.gov](mailto:caroline.jalanti@dec.ny.gov)

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Anthony Perretta, NYSDOH Project Manager

Phone: (518) 402-7860

Email address: [Anthony.perretta@health.ny.gov](mailto:Anthony.perretta@health.ny.gov)

All recipients noted within organizational chart will receive a copy of the QAPP.

### B.1 BACKGROUND

The Former Nepera Harriman Site is located in the Village of Harriman, Orange County, New York. The southwest portion of the Site is located in the Town/Village of Woodbury. The boundaries of the Site include NYS Route 17 to the northwest, the West Branch of the Ramapo River (the river) to the northeast, the Erie Rail line to the west-southwest, and an undeveloped parcel of land (the "Avon Parcel") to the south, currently owned by ELT Harriman, LLC (ELT). The Site encompasses approximately 28 acres and consists of two general areas: (1) approximately 10 acres located to the northeast of Arden House Road, on which the former administrative offices, a parking lot, and the former wastewater (now State Pollutant Discharge Elimination System (SPDES)) lagoon are located, and (2) approximately 18 acres to the southwest of Arden House Road, on which the former manufacturing facilities were located. The owner and operator of the Site at the time of the issuance of this ISMP is ELT Harriman, LLC.

Groundwater at the Site will be monitored to track and document groundwater quality in both the overburden and bedrock water-bearing units as part of a long-term monitoring program. On the basis of steady concentrations observed over years of monitoring, the long-term program includes the collection of groundwater samples every five quarters, such that any potential seasonal changes are reflected in the collected data. Modifications to the program may be implemented pending additional remedial actions that may or may not be implemented.

## **B.2 PROJECT/TASK DESCRIPTION**

---

### **B.2.1 Project overview**

Water quality sampling is conducted on a schedule of every five quarters. This work consists of:

- Measurement of groundwater levels in 43 monitoring wells;
- Collection of groundwater samples from the following monitoring wells installed within the overburden aquifer: MW-1S, MW-5S, MW-7S, MW-8S, MW-11S, MW-12S, MW-16S, MW-20S, MW-24S, MW-25S, MW-33S, MW-35S, MW-37S, MW-53D, MW-101, MW-102, MW-103, MW-104, MW-105, MW-106, OW-6, OW-7 and RW-1R;
- Collection of groundwater samples from the following monitoring wells installed within the bedrock aquifer: MW-6D, MW-20D, MW-23D, MW-26D, MW-27D and MW-20DR;
- Analyses of all collected groundwater samples for the volatile organic compounds of benzene, toluene, ethylbenzene and total xylenes; for the site-specific compounds pyridine, alpha-picoline and 2-aminopyridine; for the PFAS Target Analyte List, and for the general chemistry parameters of iron, manganese, sulfate, and ammonia;
- Analysis for the PFAS Target Analyte List in wells AMW-1, MW-9S, MW-201, MW-202S, and MW-202D; and
- Analysis of mercury in wells MW-1S, MW-24S, MW-101, and MW-102.

### **B.2.2 Project summary and work schedule**

Water quality sampling is conducted using low flow sampling methodology on a schedule of every five quarters.

## **B.3 QUALITY OBJECTIVES AND CRITERIA**

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### **B.3.1 Quality objectives**

Data collected under this QAPP must be suitable for demonstrating the quality of groundwater within the Site area per applicable NYSDEC criteria. In order to meet these data needs, the data quality objectives are summarized as follows:

- Data submitted for laboratory analysis must be collected, handled, and analyzed in accordance with consistent, standardized procedures. Detection limits must be capable of meeting the following:
  - NYSDEC Class GA Standards: New York State Department of Environmental Conservation Ambient Water Quality Standards for Source of Drinking Water Title 6 Part 703 (per August 1999 Amendment)
  - NYSDEC July 2020 TOGS Guidance
- Field measurements must also be collected with the appropriate equipment that is calibrated and functioning properly and can provide measurement to the specified degree of accuracy:

- Water level (elevation) data must be consistently measured to an accuracy of 0.01 feet.
- Groundwater quality data collected in the field (field measurements) must be consistently measured using instruments calibrated in accordance with the manufacturer's recommendations.

### B.3.2 Data Quality Objectives

Measurement variability: This project will require QC standards, blanks, and duplicate samples be analyzed in the laboratory. QC sample results will be evaluated against precision and accuracy criteria established in approved analytical methods to assess the reliability of the analytical measurements. New York State Public Health Law (PHL) § 502 requires environmental laboratory analyses of samples originating from New York State, “for the purposes of public or personal health protection or the protection of the environment or natural resources” be performed by a laboratory certified by the New York State Department of Health’s Environmental Laboratory Approval Program (NYSDOH ELAP) for which the Commissioner of Health issues certificates. The NYSDOH administers ELAP pursuant to PHL § 502 and regulates laboratories through 10 NYCRR Part 55, Subpart 55-2. By utilizing a NYSDOH ELAP certified laboratory, (Eurofins Edison, NYSDOH ELAP certificate 11452; Eurofins Buffalo, NYSDOH ELAP certificate 10026; Eurofins Denver NYSDOH ELAP certificate 11964) this project will follow PHL § 502 and help ensure consistency and comparability of environmental measurements and demonstrate laboratory capability.

Field and overall project variability: This project will follow the sampling design and sample collection techniques as outlined in Section A6 to help ensure sample results are reflective of both the characteristics and concentration of the groundwater underlying the former Nepera Site. To evaluate the effectiveness of project quality controls, variability (random or systematic) will be assessed through the following indicators:

- Precision provides information about the consistency of the application of project methods by measuring the same characteristic over repeated measurements. It is expressed in terms of the relative percent difference (RPD) between two measurements (A and B), and is computed as follows:

$$RPD = A - B \times 100 / (A + B)/2$$

Laboratory duplicates will be collected at a frequency of one duplicate for every 20 samples submitted for laboratory analysis to assist in the evaluation of precision. Matrix spike duplicates may be analyzed in place of laboratory duplicates.

- Bias/Accuracy is a measure of confidence that describes how close a measurement is to its “true” value. Analytical laboratory accuracy is determined by the percent recovery of the target analyte in spiked samples and by recoveries of the surrogates in all samples and QC samples. Accuracy is calculated as follows:

$$\%R = \text{Analyzed value} \times 100 / \text{true value}$$

Accuracy will be assessed through the analyses of laboratory control samples, matrix spikes, and surrogate spikes.



- Representativeness is a measure of how well collected samples reflect the characteristics in both composition and concentration of the environmental condition. This project will ensure samples are representative by collecting them at locations throughout the Site representing both overburden and bedrock water-bearing zones. In addition, samples will be collected every five quarters to assess potential seasonal variability.
- Completeness is the comparison of the amount of useable data collected against the amount of data required to meet project objectives. Completeness is measured in the field and in the laboratory. This project requires 90% completeness for both. Therefore, when safety or environmental issues prevent sampling, samples may be collected during the next sampling event and additional sampling will not be required unless more than 10% of the locations could not be sampled during a given sampling event. For the purpose of measuring completeness, data qualified as estimated during data validation will be considered valid while rejected data is not valid or usable for any purpose.
- Comparability is the degree to which data can be correlated with other sets of data. By adhering to the standardized sample collection methods detailed in this QAPP and using approved analytical methods followed by a NYSDOH ELAP certified laboratory, the collected data will be comparable over time and to applicable water quality criteria.
- Sensitivity is the ability of a method to detect and quantify a parameter. The measurements used in this project must be sufficiently sensitive to determine compliance with NYS water quality standards/guidance values. Analytical laboratories are required to follow NYSDOH ELAP certification guidance and 40 CFR Part 136 in determining Method Detection Limits.

Any limitations on the use of the environmental data collected as part of this project will include:

- Application of data qualifiers as stated within the analytical report narrative and as applied during data validation.
- A final project report that summarizes the identification of all data limitations.
- Documentation of project evaluation of data limitations will be noted in the Data Useability Summary Report (DUSR).

## **B.4 SPECIAL TRAINING/CERTIFICATION**

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The Project Manager is responsible for ensuring that all personnel involved with data generation have the necessary experience and training (both technical and quality assurance) to successfully complete their tasks and functions.

The Project Manager will ensure that all individuals involved with the project receive and are familiar with this document and the following specified SOP to ensure proper adherence to the procedures outlined within.

## **B.5 DOCUMENTS AND RECORDS**

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### **B.5.1 Report format/information**

Analytical data will be obtained directly from the laboratory in both electronic and hard copy format. A report that presents the results of groundwater monitoring activities performed at the Nepera Inc. – Harriman Site will be prepared and submitted to all involved parties after each fifth-quarter sampling event is complete. The report will document the field sample collection methodology, field parameter measurements, and summarize the analytical results in tabular format with comparison to applicable water quality criteria. The report will include copies of the NY Category B laboratory data reports and associated QA/QC data. Reports will be distributed in PDF format.

### **B.5.2 Document/record control**

Field data will be recorded manually on Field Data Sheets which indicate the well ID, field measurements including depth to water and low-flow stabilization parameters, the time of sampling and the identification of any QC samples that were collected at that location.

Chain-of-Custody and/or Transmission forms will be kept with the sample transport and included in laboratory data packages.

### **B.5.3 Storage of Project Information**

Field logbooks, notebooks, and/or field data sheets will be filled out using “write in the rain” ink. Changes/errors are not to be erased, instead a single strike out of the error will be used, followed by the individual's initials, and corrected information. Logbooks will be bound. Procedural or equipment problems are recorded on the field data sheets along with data results. Any deviation from this Quality Assurance Project Plan will be noted.

The DUSR will include information on field and/or laboratory QA/QC problems and any corrective actions.

All samples are labeled with unique sample ID#, monitor's initials, date, time of collection, and parameters to be analyzed.

Chain-of-Custody and/or Transmission forms will be kept with the sample transport and included in laboratory data packages.

All records and documents will be retained for at least 10 years from the completion of the project. All information will be available to NYSDEC for review upon request.

Laboratory data packages will be maintained in PDF format. Analytical results will be maintained in a database.

## **C. DATA GENERATION AND ACQUISITION**

### **C.1 SAMPLING PROCESS DESIGN (EXPERIMENTAL DESIGN)**

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The long-term monitoring program includes the collection of groundwater samples from representative overburden and bedrock monitoring wells spatially distributed within the former manufacturing area and along the down gradient property boundary adjacent to the North Branch of the Ramapo River. Specifically, this includes the following:

- Collection of groundwater samples from the following monitoring wells installed within the overburden aquifer: MW-1S, MW-5S, MW-7S, MW-8S, MW-11S, MW-12S, MW-16S, MW-20S, MW-24S, MW-25S, MW-33S, MW-35S, MW-37S, MW-53D, MW-101, MW-102, MW-103, MW-104, MW-105, MW-106, OW-6, OW-7, and RW-1R;
- Collection of groundwater samples from the following monitoring wells installed within the bedrock aquifer: MW-6D, MW-20D, MW-23D, MW-26D, MW-27D, and MW-20DR;
- Analyses of all collected groundwater samples for the volatile organic compounds benzene, toluene, ethylbenzene, and total xylenes; for the site-specific compounds pyridine, alpha-picoline and 2-aminopyridine; for the PFAS Target Analyte List; and for the general chemistry parameters iron, manganese, sulfate, and ammonia;
- Analysis for the PFAS Target Analyte List in wells AMW-1, MW-9S, MW-201, MW-202S, and MW-202D; and
- Analysis of mercury in wells MW-1S, MW-24S, MW-101, and MW-102.

Laboratory duplicates will be collected at a frequency of one duplicate for every 20 samples submitted for analyses.

On the basis of consistent water quality results observed over many years, sampling is conducted every five quarters. Sampling every five quarters provides for sample collection during various seasons, such that seasonal variability, if present, may be assessed.

The objective of the long-term sampling program is to document water quality within the former manufacturing area and along the downgradient perimeter of the property adjacent to the North Branch of the Ramapo River. Water quality results are compared to applicable NY water quality criteria.

### **C.2 SAMPLING METHODS**

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#### **C.2.1 Groundwater Level Measurements**

The depth-to-water in 43 select monitoring wells will be measured utilizing an electronic water level indicator accurate to within 0.01 feet.

#### **C.2.2 Groundwater Sampling**

Groundwater sampling methodology will consist of low flow purging and the subsequent collection of samples upon the stabilization of measured and recorded field parameters (oxidation-reduction potential, pH, conductivity,

temperature, dissolved oxygen and turbidity). A submersible bladder pump, placed at well-screen (or open borehole) depth with per-well dedicated HDPE tubing, will be used for both purging and sample collection. Field parameters will be measured using a multi-parameter meter (e.g., Horiba U-22XD) and flowthrough cell.

The sampling procedure will be as follows:

- Prepare sampling equipment and sample containers in advance.
- Confirm the monitoring well identification and condition.
- Unlock the monitoring well (if locked).
- Measure depth to water with an electronic water level indicator/interface probe and record reading.
- Measure total depth of well and compare reading to well construction data. If any significant deviation is found, confirm whether sampling should proceed.
- If well is not equipped with dedicated sampling equipment, fit previously decontaminated pump (submersible, positive displacement) with new 3/8" maximum, HDPE tubing. Lower the pump into the well, proceeding slowly once contact with the water surface is made. Lower the pump to a predetermined elevation at the mid-point of the screened interval.
- Run the pump for an initial period to clear the system of any potential sediments or debris. Do not exceed the recharge rate of the well (i.e., there should be minimum drawdown). The pump should be started and maintained at a flow rate between 100 and 500 ml/min so that drawdown does not exceed 0.3 ft.
- Measure and record well stabilization parameters. Well conditions are considered stable when three consecutive readings fall within the following criteria:

| Parameter            | Criteria                                                                                 |
|----------------------|------------------------------------------------------------------------------------------|
| pH                   | ± 0.1 standard units                                                                     |
| Specific Conductance | ± 10.0 µmhos/cm for values < 1000 µmhos/cm<br>± 20.0 µmhos/cm for values > 1000 µmhos/cm |
| Dissolved Oxygen     | ± 0.05 mg/L for values < 1 mg/L<br>± 0.2 mg/L for values > 1 mg/L                        |
| Temperature          | ± 0.1° Celsius                                                                           |
| ORP                  | ± 10 millivolts                                                                          |

- After well stabilization, collect samples into sample containers as listed in the table in Section B.3.

In order to negate the potential for cross-well contamination, non-dedicated sampling equipment will be cleaned internally and externally with an Alconox and water solution, followed by a distilled water rinse, between monitoring locations.

Following the completion of each daily sampling event, collected samples will be submitted under chain-of-custody control to a New York State Certified Analytical Laboratory. Pre-cleaned sample bottles will be provided by the analytical laboratory prior to each sampling event. Bottles will be stored in a cooler in a location free from dust, water, or other potential contamination.

Sample labels are required on sample containers for the primary purpose of sample identification. Specific field data need not be recorded on the labels as they would be recorded in the field logbook. Time of sample collection will be recorded in the field data sheet and laboratory chain-of-custody form. The chain-of-custody form will also contain the following information:

- Client and Project Name
- Sample or location identification number
- Analysis to be performed
- Preservative (if required)
- Laboratory name and address
- Date of sample collection
- Sampler's initials

### C.3 SAMPLE HANDLING AND CUSTODY

The sample containers are labeled, placed in a laboratory supplied cooler, packed on ice (to maintain a temperature of 4° C), and later transmitted via chain-of-custody to a New York certified laboratory.

Sample preservation is to be performed immediately upon collection. Samples are to be analyzed as soon as possible after collection. The times listed below are the maximum times samples may be held and still considered valid. The specific requirements for container types, preservation methods, and maximum holding times for samples are listed below. Laboratory-supplied sample containers will be used.

| Matrix  | Parameters                 | Containers (number, size, and type) <sup>1</sup> | Preservation Requirements                              | Maximum Holding Time (preparation/analysis) <sup>2</sup>  |
|---------|----------------------------|--------------------------------------------------|--------------------------------------------------------|-----------------------------------------------------------|
| Aqueous | Volatile Organic Compounds | (3) 40 mL VOA vials w/Teflon lined septum        | HCl to pH<2; cool to 6°C; no headspace                 | 14 days preserved (7 days unpreserved)                    |
| Aqueous | SVOCs                      | 2 x 1-L amber glass                              | cool to 6°C                                            | 7 days to extraction; 40 days from extraction to analysis |
| Aqueous | Metals                     | 250 mL plastic                                   | HNO3 to pH<2; cool                                     | Fe/Mn=180 days<br>Hg=28 days                              |
| Aqueous | Ammonia                    | 250 mL Plastic                                   | Cool, 6°C.<br>H <sub>2</sub> SO <sub>4</sub> to pH < 2 | 28 days                                                   |
| Aqueous | Sulfate                    | 250 mL Plastic                                   | cool to 6°C                                            | 7 days                                                    |
| Aqueous | PFAS                       | 2 x 250 mL Plastic                               | cool to 6°C                                            | 28 days to extraction                                     |
|         |                            |                                                  | ≤ - 20°C                                               | 90 days to extraction                                     |
|         |                            |                                                  | cool to 6°C                                            | 28 days to analysis                                       |

The number in parentheses in the "Sample Container" column denotes the number of containers needed.



Laboratory Fortified Matrix analysis conducted at a frequency of 1 per 20 samples.

Notes:

1. Container types and quantities as listed in “US EPA Region 2 Laboratory – Volume, Container & Preservation Requirements,” April 2005. Subject to change.
2. Holding time is technical holding time and is calculated from time of sample collection.

## C.4 ANALYTICAL METHODS

The below table lists the parameter, analytical method, and quality control criteria.

| Parameter | Analytical Method        | Data Quality Indicator (DQI) | QC Sample or Measurement Performance Criteria  | Measurement Performance Criteria       |
|-----------|--------------------------|------------------------------|------------------------------------------------|----------------------------------------|
| TCL VOCs  | SW846 8260D              | Precision                    | Matrix Spike (MS)/Matrix Spike Duplicate (MSD) | Standard Laboratory Statistical Limits |
|           | SW846 8260D              | Accuracy-Laboratory          | Laboratory Control Sample                      | Standard Laboratory Statistical Limits |
|           | SW846 8260D              | Accuracy-Contamination       | Method Blank, Trip Blank, Equipment Blank      | <Reporting Limit                       |
| SVOCs     | SW846 8270D/ 8270E – SIM | Precision                    | MS/MSD                                         | Standard Laboratory Statistical Limits |
|           | SW846 8270D/ 8270E – SIM | Accuracy-Laboratory          | Laboratory Control Sample                      | Standard Laboratory Statistical Limits |
|           | SW846 8270D/ 8270E – SIM | Accuracy-Contamination       | Equipment Blank                                | < Reporting Limit                      |
| Metals    | SW846 6020B/ 7470A       | Precision                    | MS/MSD                                         | ≤ 20% RPD/75 – 125%                    |
|           | SW846 6020B/ 7470A       | Accuracy-Laboratory          | Laboratory Control Sample                      | 80 – 120%                              |
|           | SW846 6020B/ 7470A       | Accuracy-Contamination       | Equipment Blank                                | <Reporting Limit                       |
| PFAS      | EPA 1633                 | Precision                    | MS/MSD                                         | Standard Laboratory                    |
|           | EPA 1633                 | Accuracy-Laboratory          | Laboratory Control Sample                      | Standard Laboratory                    |
|           | EPA 1633                 | Accuracy-Contamination       | Equipment Blank                                | <Reporting Limit                       |
| Ammonia   | EPA 350.1                | Precision                    | MS/MSD                                         | Standard Laboratory                    |
|           | EPA 350.1                | Accuracy-Laboratory          | Laboratory Control Sample                      | Standard Laboratory                    |
|           | EPA 350.1                | Accuracy-Contamination       | Equipment Blank                                | <Reporting Limit                       |
|           | EPA 300.0                | Precision                    | MS/MSD                                         | ≤ 10% RPD                              |

|         |           |                        |                           |                   |
|---------|-----------|------------------------|---------------------------|-------------------|
| Sulfate | EPA 300.0 | Accuracy-Laboratory    | Laboratory Control Sample | 85-115%           |
|         | EPA 300.0 | Accuracy-Contamination | Equipment Blank           | < Reporting Limit |

The table below lists the method detection limit (MDL), the method reporting limit (MRL) for each analyte to be reported. The NYSDEC published water quality standards can be found in Attachment A.

| Parameter                                                               | Analytical Method                     | MDL <sup>1</sup> | MRL <sup>1</sup> |
|-------------------------------------------------------------------------|---------------------------------------|------------------|------------------|
| <b>Conventional (mg/L)</b>                                              |                                       |                  |                  |
| Ammonia                                                                 | EPA 350.1                             | 0.050            | 0.100            |
| Sulfate                                                                 | EPA 300.0                             | 0.0950           | 0.480            |
| <b>Metals (µg/L)</b>                                                    |                                       |                  |                  |
| Iron                                                                    | EPA 6020B                             | 112              | 150              |
| Manganese                                                               | EPA 6020B                             | 1.76             | 15.0             |
| Mercury                                                                 | EPA 7470A                             | 0.0910           | 0.200            |
| <b>Volatile Organic Compounds (µg/L)</b>                                |                                       |                  |                  |
| Benzene                                                                 | EPA 8260D                             | 0.203            | 1.00             |
| Ethylbenzene                                                            | EPA 8260D                             | 0.298            | 1.00             |
| Toluene                                                                 | EPA 8260D                             | 0.379            | 1.00             |
| Total Xylenes                                                           | EPA 8260D                             | 0.654            | 2.00             |
| <b>Semivolatile Organic Compounds (µg/L)</b>                            |                                       |                  |                  |
| 2-Aminopyridine (TIC)                                                   | EPA 8270D                             | 5.00             | 10.0             |
| alpha-Picoline                                                          | EPA 8270D                             | 1.40             | 80.0             |
| Pyridine                                                                | EPA 8270D                             | 0.410            | 25.0             |
| 1,4-Dioxane                                                             | EPA 8270E - SIM<br>(isotope dilution) | 0.174            | 0.200            |
| <b>Perfluoroalkyl and Polyfluoroalkyl Substances (ng/L)<sup>2</sup></b> |                                       |                  |                  |
| Perfluorobutanoic acid (PFBA)                                           | EPA 1633                              | 2.00             | 8.0              |
| Perfluoropentanoic acid (PFPeA)                                         | EPA 1633                              | 1.00             | 4.00             |
| Perfluorohexanoic acid (PFHxA)                                          | EPA 1633                              | 0.500            | 2.00             |
| Perfluoroheptanoic acid (PFHpA)                                         | EPA 1633                              | 0.520            | 2.00             |
| Perfluorooctanoic acid (PFOA)                                           | EPA 1633                              | 0.640            | 2.00             |
| Perfluorononanoic acid (PFNA)                                           | EPA 1633                              | 0.500            | 2.00             |
| Perfluorodecanoic acid (PFDA)                                           | EPA 1633                              | 0.500            | 2.00             |
| Perfluoroundecanoic acid (PFUnA)                                        | EPA 1633                              | 0.500            | 2.00             |
| Perfluorododecanoic acid (PFDoA)                                        | EPA 1633                              | 0.500            | 2.00             |
| Perfluorotridecanoic acid (PFTriA)                                      | EPA 1633                              | 0.500            | 2.00             |
| Perfluorotetradecanoic acid (PFTeDA)                                    | EPA 1633                              | 0.500            | 2.00             |
| Perfluorobutanesulfonic acid (PFBS)                                     | EPA 1633                              | 0.300            | 2.00             |
| Perfluoropentanesulfonic acid (PFPeS)                                   | EPA 1633                              | 0.500            | 2.00             |

| Parameter                                   | Analytical Method | MDL <sup>1</sup> | MRL <sup>1</sup> |
|---------------------------------------------|-------------------|------------------|------------------|
| Perfluorohexanesulfonic acid (PFHxS)        | EPA 1633          | 0.570            | 2.00             |
| Perfluoroheptanesulfonic acid (PFHpS)       | EPA 1633          | 0.400            | 2.00             |
| Perfluorooctanesulfonic acid (PFOS)         | EPA 1633          | 0.500            | 2.00             |
| Perfluorononanesulfonic acid (PFNS)         | EPA 1633          | 0.400            | 2.00             |
| Perfluorodecanesulfonic acid (PFDS)         | EPA 1633          | 0.500            | 2.00             |
| Perfluorododecanesulfonic acid (PFDoS)      | EPA 1633          | 0.900            | 2.00             |
| 4:2 FTS                                     | EPA 1633          | 1.70             | 8.00             |
| 6:2 FTS                                     | EPA 1633          | 2.50             | 8.00             |
| 8:2 FTS                                     | EPA 1633          | 2.60             | 8.00             |
| Perfluorooctanesulfonamide (PFOSA)          | EPA 1633          | 0.500            | 2.00             |
| NMeFOSA                                     | EPA 1633          | 0.500            | 2.00             |
| NEtFOSAA                                    | EPA 1633          | 0.500            | 2.00             |
| NMeFOSAA                                    | EPA 1633          | 1.20             | 4.00             |
| NEtFOSAA                                    | EPA 1633          | 0.700            | 2.00             |
| NMeFOSE                                     | EPA 1633          | 5.00             | 20.0             |
| NEtFOSE                                     | EPA 1633          | 5.00             | 20.0             |
| HFPO-DA (GenX)                              | EPA 1633          | 2.00             | 8.00             |
| 4,8-Dioxa-3H-perfluorononanoic acid (ADONA) | EPA 1633          | 1.50             | 8.00             |
| PFMBA                                       | EPA 1633          | 1.00             | 4.00             |
| NFDHA                                       | EPA 1633          | 1.00             | 4.00             |
| PFMPA                                       | EPA 1633          | 0.500            | 4.00             |
| 9CI-PF3ONS                                  | EPA 1633          | 1.00             | 8.00             |
| 11CI-PF3OUdS                                | EPA 1633          | 2.00             | 8.00             |
| PFEESA                                      | EPA 1633          | 0.500            | 4.00             |
| 3:3 FTCA                                    | EPA 1633          | 1.50             | 10.0             |
| 5:3 FTCA                                    | EPA 1633          | 10.0             | 50.0             |
| 7:3 FTCA                                    | EPA 1633          | 10.0             | 50.0             |

1. Actual MDLs and MRLs may vary based on sample aliquot size and required dilution factor.

## C.5 QUALITY CONTROL

Field duplicates, matrix spikes and equipment blanks will be collected in accordance with the table below.

| Matrix      | Analytical Group  | Analytical and Preparation SOP Reference <sup>1</sup> | No. of Sampling Locations <sup>2</sup> | No. of Field Duplicate Pairs | No. of Extra Volume Laboratory QC (e.g., MS/MSD) Samples <sup>3</sup> | No. of Field Blanks | No. of Trip Blanks |
|-------------|-------------------|-------------------------------------------------------|----------------------------------------|------------------------------|-----------------------------------------------------------------------|---------------------|--------------------|
| Groundwater | Volatile Organics | EPA 8260D                                             | TBD                                    | 1 per 20                     | 1 set per 20                                                          | 1 per 20            | 1 per shipment     |
| Groundwater | SVOCs             | EPA 8270D/8270E - SIM                                 | TBD                                    | 1 per 20                     | 1 set per 20                                                          | 1 per 20            | 0                  |
| Groundwater | Metals            | SW846 6020B 7470A                                     | TBD                                    | 1 per 20                     | 1 set per 20                                                          | 1 per 20            | 0                  |
| Groundwater | PFAS              | EPA 1633                                              | TBD                                    | 1 per 20                     | 1 set per 20                                                          | 1 per 20            | 0                  |
| Groundwater | Ammonia           | EPA 350.1                                             | TBD                                    | 1 per 20                     | 1 set per 20                                                          | 1 per 20            | 0                  |
| Groundwater | Sulfate           | EPA 300.0                                             | TBD                                    | 1 per 20                     | 1 set per 20                                                          | 1 per 20            | 0                  |

<sup>1</sup>Published Standard Operating Procedures shown that may vary by laboratory.

<sup>2</sup>Number of samples for each event to be determined in the field.

Additional volume will be collected for QC analyses as required by the laboratory (e.g., three additional VOA vials per QC sample).

### C.5.1 PFAS Sample Collection

The probability of false positives is relatively high during PFAS sample collection due to the potential for many sources of cross-contamination, combined with low laboratory detection limits. PFAS are used in a wide variety of products; therefore, to prevent cross-contamination, field personnel should be familiar with and follow the New York Department of Environmental Conservation (NYSDEC) Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS; NYSDEC 2023).

## C.6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

The following field instruments may be used during sampling activities at the Site:

- ORP, DO, pH, Specific Conductivity, and Turbidity meter – Horiba multi sensor probe (or equivalent).

Monitoring equipment will be protected (as much as practical) from contamination during field exploration without hindering operation of the unit. Operation of the equipment will be in accordance with the manufacturer's instructions provided with each piece of equipment. Calibration of the equipment will be conducted each day in accordance with the manufacturer's instructions. If calibration is not maintained, the equipment will be placed on hold and not used until calibration is confirmed. Information related to calibration will be recorded in the field logbook and will include the instrument ID, date and time of calibration, calibration standard, and record of calibration measurement.

Field equipment is maintained, inspected, and cleaned according to the manufacturer's specifications. Any defective equipment is taken out of service until it has been shown to perform satisfactorily.

Equipment and reference material records include the following:

- Name of item
- Manufacturer, identification, serial number
- Copy of manufacturer's instructions or manuals
- Details of maintenance carried out to date
- History of damage, malfunctions, modification, or repair

Service of equipment is performed by quality service organizations.

For instruments operated in the analytical laboratory, testing, inspection, and maintenance will be performed in accordance with guidelines detailed by the analytical methods and NYSDOH ELAP certification requirements.

## **C.7 INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY**

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Calibration of field equipment will be conducted each day in accordance with the manufacturer's instructions. If calibration is not maintained, the equipment will be placed on hold and not used until calibration is confirmed. Calibration documentation on rented field equipment will be reviewed to confirm that the equipment has been properly calibrated and maintained. Information related to calibration will be recorded in the field logbook and will include the instrument ID, date and time of calibration, calibration standard, and record of calibration measurement.

For instruments operated by/in the analytical laboratory, calibrations and confirmations of calibration will be performed in accordance with guidelines detailed by the analytical methods and NYSDOH ELAP certification requirements.

## **C.8 INSPECTION/ACCEPTANCE FOR SUPPLIES AND CONSUMABLES**

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The Project Quality Assurance Officer or designee will ensure that calibration reagents and/or standards are within technical specifications before use. Prior to each sampling event supplies for instrument calibration or sample handling are to be checked for expiration date, sufficient quantity and any anomalies (discoloration) that might indicate they are no longer useable.

## **C.9 NON-DIRECT MEASUREMENTS (I.E., EXISTING DATA)**

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Existing data consists of analytical results from prior sampling events conducted in accordance with the protocols and procedures contained within the QAPP and are thus deemed suitable for use and comparison to future results.

## **C.10 DATA MANAGEMENT**

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The Project Manager is responsible for ensuring that the management of the data is handled in a manner that maintains data integrity and that staff follow the protocols as outlined in this document. Any changes or alterations to the strategy for data management must be documented and recorded in the final report of the study.

All data collected by the field personnel for this project will be maintained in appropriate bound notebooks and secure electronic databases. Analytical results will be transferred from the laboratory to the project team in an agreed upon electronic format that can be input directly to the project team's electronic database. An automated data review will be conducted to ensure laboratory metadata aligns with field sampling entries (i.e., date/time of sample collection, parameters analyzed). If discrepancies are noted, the laboratory will be contacted to resolve the issues.



Field data and observations are documented in field logbooks at the time measurements are taken. Field logbook information will be transferred to the project database by the field personnel that collected the field information or designee. Review of data entries will be conducted on 10% of sampling events to assess for transcription errors.

## **D. ASSESSMENT/OVERSIGHT**

### **D.1 ASSESSMENT AND RESPONSE ACTIONS**

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The Project Manager will thoroughly brief Field Personnel prior to the start of project tasks and after to identify emerging/unanticipated problems and take corrective action, if necessary.

The Project Quality Assurance Officer will ensure that forms and logbooks are completed correctly. Approximately 10% of logbook entries and forms will be reviewed for entry errors. Errors will be documented and evaluated to determine if corrective actions such as additional training is required. All identified deficiencies and corrective actions are to be brought to the Project Manager's attention.

The Project Quality Assurance Officer will review all quality control results to assess compliance with data quality acceptance criteria. Results outside acceptance criteria will be evaluated. Appropriate corrective actions will be taken, and results will be qualified as applicable.

### **D.2 REPORTS TO MANAGEMENT**

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Following the receipt of data, a summary report will be prepared with summary tables, figures, and the laboratory report submitted to the NYSDEC and the NYSDOH. Additionally, laboratory EDDs will be reviewed for accuracy and consistency with previously collected data and uploaded to the NYSDEC EQulS system in the correct format.

## **E. DATA REVIEW AND EVALUATION**

### **E.1 DATA REVIEW, VERIFICATION AND VALIDATION**

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The Project Manager and the Quality Assurance Officer are responsible for determining that data are of adequate quality to support this project. The project will be modified as directed by the Project Manager. The Project Manager shall be responsible for the implementation of changes to the project and shall document the effective date of all changes made.

The Project Manager shall authorize all changes or deviations in the operation of the project. Any significant changes will require an amendment to the QAPP.

The Quality Assurance Officer will perform quality checks of data packages to identify any systemic errors. Field data will be reviewed to ensure information is complete and note any deviations from this QAPP. Deviations will be brought to the attention of the Project Manager.

Laboratory Project Managers will confirm sample receipt, requested analyses, condition of samples, and deliverables format and turnaround time (TAT) via email. Any problems with the condition of the sample will be addressed with the Field Sampling Team and Corrective Action Procedures will be implemented if problems are found to exist. If necessary, re-sampling will be conducted during the same sampling program if any samples are of insufficient volume or were damaged or have sample preservation issues that would qualify the results.

In addition, following completion of a specific field sampling event, copies of the field notebooks will be prepared, and an electronic file of the field notes will be generated. The Project Manager will review the field notebook documents, and confirm that the required field data was generated, that field duplicates were identified, and any sample problems were noted and addressed.

### **E.2 VERIFICATION AND VALIDATION METHODS**

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Following receipt of each laboratory analytical data package, data validation will be conducted by a third-party validator or qualified Anchor QEA staff to ensure the usability of the laboratory analytical data, and that it meets the data quality objectives of the investigation.

Following receipt of an analytical data package, the following steps will be performed:

- Chain-of-custody documentation will be reviewed to verify completeness of data
- Review of case narratives to note any analytical problems
- Review of method detection limits (MDLs) to verify that reporting limits were met
- Evaluation of equipment blank results for potential field contamination
- Evaluation of sample duplicate samples to evaluate overall sampling precision
- Comparison of results to previous sampling events for same monitoring well, if available
- Completion of a Data Usability Summary Report (DUSR)

### **E.3 EVALUATING DATA IN TERMS OF USER NEEDS**

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Potential concerns regarding the use of the analytical data, as determined by deficiencies identified in review of the analytical data package as referenced above, will be described and recommendations will be made as to whether the data can be used with or without qualification, or should be rejected entirely. For example, a high

reporting limit at a location with historically high concentrations would not require qualification of the results and the data would meet the objective of the sampling program in documenting groundwater quality over time. Conversely, high surrogate recoveries for a given compound, and results that are notably higher than historical concentrations, would result in a recommendation that the results be considered as estimated, potentially biased high, and that subsequent sampling results should be reviewed before making any further conclusions.

6 CRR-NY 703.5  
NY-CRR

OFFICIAL COMPILATION OF CODES, RULES AND REGULATIONS OF THE STATE OF NEW YORK  
TITLE 6. DEPARTMENT OF ENVIRONMENTAL CONSERVATION  
CHAPTER X. DIVISION OF WATER RESOURCES  
SUBCHAPTER A. GENERAL  
ARTICLE 2. CLASSIFICATIONS AND STANDARDS OF QUALITY AND PURITY  
PART 703. SURFACE WATER AND GROUNDWATER QUALITY STANDARDS AND GROUNDWATER EFFLUENT  
LIMITATIONS

6 CRR-NY 703.5

6 CRR-NY 703.5

703.5 Water quality standards for taste-, color- and odor-producing, toxic and other deleterious substances.

(a) Water quality standards for specific substances or groups of substances are listed in Table 1 of subdivision (f) of this section for the applicable water classes. The substance name is listed with the associated Chemical Abstract Service Registry Number (CAS No.) where applicable. For entries in Table 1 of subdivision (f) of this section that refer to chemical groups, congeners or other expressions of multiple substances, the standard applies to the sum of the substances, unless otherwise indicated.

(b) Standards are Health (Water Source), Health (Fish Consumption), Aquatic (Chronic), Aquatic (Acute), Wildlife, Aesthetic (Water Source), Aesthetic (Food Source), or Recreation based and are respectively designated as H(W/S), H(FC), A(C), A(A), W, E(W/S), E(FS), or R in the column headed "Type." Where more than one Type of standard is listed for a water class, the most stringent applies.

(c) The "Basis Code" in Table 1 of subdivision (f) of this section provides a further description of the basis of the standard. A list of basis codes is found in Table 2 of subdivision (f) of this section.

(d) The standard is the maximum allowable concentration in micrograms per liter (ug/L), unless otherwise noted. A standard defined by the symbol "ND" means not detectable by the analytical tests specified or approved pursuant to Part 700 of this Title.

(e) Special interpretive remarks are provided as necessary.

**(f) Tables.**

**Table 1**

(*cf. section 703.5*)

**WATER QUALITY STANDARDS SURFACE WATERS AND GROUNDWATER**

| SUBSTANCE<br>(CAS NO.)      | WATER CLASSES                                                                                                                         | STANDARD<br>(ug/L) | TYPE             | BASIS<br>CODE |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------------|---------------|
| Acenaphthene<br>(83-32-9)   | A, A-S, AA, AA-S                                                                                                                      | 20                 | E(W/S)           | U             |
| Acetaldehyde<br>(75-07-0)   | A, A-S, AA, AA-S<br>GA                                                                                                                | 8<br>8             | H(W/S)<br>H(W/S) | A<br>A        |
| Acrolein<br>(107-02-8)      | GA                                                                                                                                    | *                  | H(W/S)           | J             |
| Remark:                     | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                    |                  |               |
| Acrylamide<br>(79-06-1)     | GA                                                                                                                                    | *                  | H(W/S)           | J             |
| Remark:                     | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                    |                  |               |
| Acrylonitrile<br>(107-13-1) | GA                                                                                                                                    | *                  | H(W/S)           | J             |
| Remark:                     | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                    |                  |               |

|                                                              |                                                                                                                                                                                                         |                    |                |        |
|--------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|----------------|--------|
| Alachlor<br>(15972-60-8)                                     | A, A-S, AA, AA-S<br>GA                                                                                                                                                                                  | 0.5<br>0.5         | H(WS)<br>H(WS) | A<br>A |
| Aldicarb<br>(116-06-3)                                       | A, A-S, AA, AA-S<br>GA                                                                                                                                                                                  | 7<br>*             | H(WS)<br>H(WS) | B      |
| Remark:                                                      | * Refer to standards for "Aldicarb and Methomyl."                                                                                                                                                       |                    |                |        |
| Aldicarb and Methomyl<br>(116-06-3;<br>16752-77-5)           | GA                                                                                                                                                                                                      | 0.35 *             | H(WS)          | F      |
| Remark:                                                      | * Applies to the sum of these substances.                                                                                                                                                               |                    |                |        |
| Aldrin<br>(309-00-2)                                         | GA<br>A, A-S, AA, AA-S, B, C, D                                                                                                                                                                         | ND<br>*            | H(WS)<br>H(FC) | F      |
|                                                              | SA, SB, SC, SD                                                                                                                                                                                          | *                  | H(FC)          |        |
| Remark:                                                      | * Refer to standards for "Aldrin and Dieldrin."                                                                                                                                                         |                    |                |        |
| Aldrin and Dieldrin<br>(309-00-2; 60-57-1)                   | A, A-S, AA, AA-S, B, C, D<br>SA, SB, SC, SD                                                                                                                                                             | 0.001<br>0.001     | H(FC)<br>H(FC) |        |
| Remark:                                                      | * Applies to the sum of these substances.                                                                                                                                                               |                    |                |        |
| Alkyldimethyl<br>benzyl ammonium<br>chloride<br>(68391-01-5) | A, A-S, AA, AA-S, B, C                                                                                                                                                                                  | *                  | A(C)           |        |
| Remark:                                                      | * Refer to standards for "Quaternary ammonium compounds."                                                                                                                                               |                    |                |        |
| Allyl chloride<br>(107-05-1)                                 | GA                                                                                                                                                                                                      | *                  | H(WS)          | J      |
| Remark:                                                      | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                                   |                    |                |        |
| Aluminum, ionic<br>(CAS No. Not Applicable)                  | A, A-S, AA, AA-S, B, C                                                                                                                                                                                  | 100 *              | A(C)           |        |
| Remark:                                                      | * For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) of this Title.                       |                    |                |        |
| Ametryn<br>(834-12-8)                                        | GA                                                                                                                                                                                                      | 50                 | H(WS)          | J      |
| 4-Aminobiphenyl<br>(92-67-1)                                 | GA                                                                                                                                                                                                      | *                  | H(WS)          | J      |
| Remark:                                                      | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                                   |                    |                |        |
| Aminocresols<br>(95-84-1;                                    | A, A-S, AA, AA-S<br>GA                                                                                                                                                                                  | *<br>*             | E(WS)<br>E(WS) |        |
| 2835-95-2;<br>2835-99-6)                                     | A, A-S, AA, AA-S, B, C, D                                                                                                                                                                               | **                 | E(FS)          |        |
| Remarks:                                                     | * Refer to standards for "Phenolic compounds (total phenols)."                                                                                                                                          |                    |                |        |
|                                                              | ** Refer to standards for "Phenols, total unchlorinated."                                                                                                                                               |                    |                |        |
| 3-Aminotoluene<br>(108-44-1)                                 | GA                                                                                                                                                                                                      | *                  | H(WS)          | J      |
| Remark:                                                      | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                                   |                    |                |        |
| 4-Aminotoluene<br>(106-49-0)                                 | GA                                                                                                                                                                                                      | *                  | H(WS)          | J      |
| Remark:                                                      | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                                   |                    |                |        |
| Ammonia and Ammonium<br>(7664-41-7;                          | A, A-S, AA, AA-S<br>GA                                                                                                                                                                                  | 2,000 *<br>2,000 * | H(WS)<br>H(WS) | H<br>H |
| CAS No.<br>Not Applicable)                                   | A, A-S, AA, AA-S, B, C<br>D                                                                                                                                                                             | **<br>**           | A(C)<br>A(A)   |        |
|                                                              | SA, SB, SC, I                                                                                                                                                                                           | 35***              | A(C)           |        |
|                                                              | SA, SB, SC, I, SD                                                                                                                                                                                       | 230***             | A(A)           |        |
| Remarks:                                                     | * NH <sub>3</sub> + NH <sub>4</sub> <sup>+</sup> as N.                                                                                                                                                  |                    |                |        |
|                                                              | ** Un-ionized ammonia as NH <sub>3</sub> ; tables below provide the standard in ug/L at varying pH and temperature for different classes and specifications. Linear interpolation between the listed pH |                    |                |        |



|  |     |                                                    |
|--|-----|----------------------------------------------------|
|  |     | values and temperatures is applicable.             |
|  | *** | Applies to un-ionized ammonia as NH <sub>3</sub> . |

#### Classes A, A-S, AA, AA-S, B, C with the (T) or (TS) Specification

| <i>pH</i> | <i>0°C</i> | <i>5°C</i> | <i>10°C</i> | <i>15°-30°C</i> |
|-----------|------------|------------|-------------|-----------------|
| 6.50      | 0.7        | 0.9        | 1.3         | 1.9             |
| 6.75      | 1.2        | 1.7        | 2.3         | 3.3             |
| 7.00      | 2.1        | 2.9        | 4.2         | 5.9             |
| 7.25      | 3.7        | 5.2        | 7.4         | 11              |
| 7.50      | 6.6        | 9.3        | 13          | 19              |
| 7.75      | 11         | 15         | 22          | 31              |
| 8.0-9.0   | 13         | 18         | 25          | 35              |

#### Classes A, A-S, AA, AA-S, B, C without the (T) or (TS) Specification

| <i>pH</i> | <i>0°C</i> | <i>5°C</i> | <i>10°C</i> | <i>15°C</i> | <i>20°-30°C</i> |
|-----------|------------|------------|-------------|-------------|-----------------|
| 6.50      | 0.7        | 0.9        | 1.3         | 1.9         | 2.6             |
| 6.75      | 1.2        | 1.7        | 2.3         | 3.3         | 4.7             |
| 7.00      | 2.1        | 2.9        | 4.2         | 5.9         | 8.3             |
| 7.25      | 3.7        | 5.2        | 7.4         | 11          | 15              |
| 7.50      | 6.6        | 9.3        | 13          | 19          | 26              |
| 7.75      | 11         | 15         | 22          | 31          | 43              |
| 8.0-9.0   | 13         | 18         | 25          | 35          | 50              |

#### Class D

| <i>pH</i> | <i>0°C</i> | <i>5°C</i> | <i>10°C</i> | <i>15°C</i> | <i>20°C</i> | <i>25°-30°C</i> |
|-----------|------------|------------|-------------|-------------|-------------|-----------------|
| 6.50      | 9.1        | 13         | 18          | 26          | 36          | 51              |
| 6.75      | 15         | 21         | 30          | 42          | 59          | 84              |
| 7.00      | 23         | 33         | 46          | 66          | 93          | 131             |
| 7.25      | 34         | 48         | 68          | 95          | 140         | 190             |
| 7.50      | 45         | 64         | 91          | 130         | 180         | 260             |
| 7.75      | 56         | 80         | 110         | 160         | 220         | 320             |
| 8.0-9.0   | 65         | 92         | 130         | 180         | 260         | 370             |

#### WATER QUALITY STANDARDS SURFACE WATERS AND GROUNDWATER

| SUBSTANCE<br>(CAS NO.)               |                                                                                                                                                                                   |  | WATER CLASSES             | STANDARD<br>(ug/L) | TYPE  | BASIS<br>CODE |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------|--------------------|-------|---------------|
| Aniline<br>(62-53-3)                 |                                                                                                                                                                                   |  | A, A-S, AA, AA-S          | 5                  | H(WS) | I             |
|                                      |                                                                                                                                                                                   |  | GA                        | *                  | H(WS) | J             |
| Remark:                              | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |  |                           |                    |       |               |
| Antimony<br>(CAS No. Not Applicable) |                                                                                                                                                                                   |  | A, A-S, AA, AA-S          | 3                  | H(WS) | B             |
|                                      |                                                                                                                                                                                   |  | GA                        | 3                  | H(WS) | B             |
| Arsenic<br>(CAS No. Not Applicable)  |                                                                                                                                                                                   |  | A, A-S, AA, AA-S          | 50                 | H(WS) | G             |
|                                      |                                                                                                                                                                                   |  | GA                        | 25                 | H(WS) | F             |
|                                      |                                                                                                                                                                                   |  | A, A-S, AA, AA-S, B, C    | 150 *              | A(C)  |               |
|                                      |                                                                                                                                                                                   |  | A, A-S, AA, AA-S, B, C, D | 340 *              | A(A)  |               |
|                                      |                                                                                                                                                                                   |  | SA, SB, SC                | 63 *               | A(C)  |               |
|                                      |                                                                                                                                                                                   |  | SD                        | 120 *              | A(A)  |               |
| Remark:                              | * Dissolved arsenic form.                                                                                                                                                         |  |                           |                    |       |               |
| Asbestos<br>(CAS No. Not Applicable) |                                                                                                                                                                                   |  | A, A-S, AA, AA-S          | *                  | H(WS) | G             |
|                                      |                                                                                                                                                                                   |  | GA                        | *                  | H(WS) | G             |
| Remark:                              | * 7,000,000 fibers (longer than 10 um)/L.                                                                                                                                         |  |                           |                    |       |               |
| Atrazine<br>(1912-24-9)              |                                                                                                                                                                                   |  | GA                        | 7.5                | H(WS) | F             |
| Azinphosmethyl<br>(86-50-0)          |                                                                                                                                                                                   |  | GA                        | 4.4                | H(WS) | F             |
|                                      |                                                                                                                                                                                   |  | A, A-S, AA, AA-S, B, C    | 0.005 *            | A(C)  |               |
|                                      |                                                                                                                                                                                   |  | SA, SB, SC                | 0.01               | A(C)  |               |
| Remark:                              | * For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) of this Title. |  |                           |                    |       |               |

|                                                 |                                                                                                                                                                                            |                           |         |       |   |
|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|---------|-------|---|
| Azobenzene<br>(103-33-3)                        |                                                                                                                                                                                            | GA                        | *       | H(WS) | J |
| Remark:                                         | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                      |                           |         |       |   |
| Barium<br>(CAS No. Not Applicable)              |                                                                                                                                                                                            | A, A-S, AA, AA-S          | 1,000   | H(WS) | G |
| Benefin<br>(1861-40-1)                          |                                                                                                                                                                                            | GA                        | 1,000   | H(WS) | F |
| Benzene<br>(71-43-2)                            |                                                                                                                                                                                            | GA                        | 35      | H(WS) | F |
|                                                 |                                                                                                                                                                                            | A, A-S, AA, AA-S          | 1       | H(WS) | A |
|                                                 |                                                                                                                                                                                            | GA                        | 1       | H(WS) | A |
|                                                 |                                                                                                                                                                                            | A, A-S, AA, AA-S, B, C, D | 10      | H(FC) | A |
|                                                 |                                                                                                                                                                                            | SA, SB, SC, I, SD         | 10      | H(FC) | A |
| Benzidine<br>(92-87-5)                          |                                                                                                                                                                                            | GA                        | *       | H(WS) | J |
|                                                 |                                                                                                                                                                                            | A, A-S, AA, AA-S, B, C    | 0.1 **  | A(C)  |   |
|                                                 |                                                                                                                                                                                            | D                         | 0.1 **  | A(A)  |   |
| Remarks:                                        | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                      |                           |         |       |   |
|                                                 | ** For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) and (d) of this Title. |                           |         |       |   |
| Benzo(a)pyrene<br>(50-32-8)                     |                                                                                                                                                                                            | GA                        | ND      | H(WS) | F |
| Beryllium<br>(CAS No. Not Applicable)           |                                                                                                                                                                                            | A, A-S, AA, AA-S, B, C    | *       | A(C)  |   |
| Remarks:                                        | * 11 ug/L when hardness is less than or equal to 75 ppm; 1,100 ug/L when hardness is greater than 75 ppm.                                                                                  |                           |         |       |   |
|                                                 | * For waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) of this Title.              |                           |         |       |   |
|                                                 | Aquatic Type standards apply to acid-soluble form.                                                                                                                                         |                           |         |       |   |
| 1,1'-Biphenyl<br>(92-52-4)                      |                                                                                                                                                                                            | GA                        | *       | H(WS) | J |
| Remark:                                         | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                      |                           |         |       |   |
| Bis(2-chloro-ethoxy)methane<br>(111-91-1)       |                                                                                                                                                                                            | GA                        | *       | H(WS) | J |
| Remark:                                         | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                      |                           |         |       |   |
| Bis(2-chloro-ethyl)ether<br>(111-44-4)          |                                                                                                                                                                                            | GA                        | 1.0     | H(WS) | F |
| Bis(chloromethyl)-ether<br>(542-88-1)           |                                                                                                                                                                                            | GA                        | *       | H(WS) | J |
| Remark:                                         | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                      |                           |         |       |   |
| Bis(2-chloro-1-methyl-ethyl)ether<br>(108-60-1) |                                                                                                                                                                                            | GA                        | *       | H(WS) | J |
| Remark:                                         | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                      |                           |         |       |   |
| Bis(2-ethyl-hexyl)phthalate<br>(117-81-7)       |                                                                                                                                                                                            | A, A-S, AA, AA-S          | 5       | H(WS) | A |
|                                                 |                                                                                                                                                                                            | GA                        | 5       | H(WS) | A |
|                                                 |                                                                                                                                                                                            | A, A-S, AA, AA-S, B, C    | 0.6     | A(C)  |   |
| Boron<br>(CAS No. Not Applicable)               |                                                                                                                                                                                            | GA                        | 1,000   | H(WS) | H |
|                                                 |                                                                                                                                                                                            | A, A-S, AA, AA-S, B, C    | 10,000* | A(C)  |   |
|                                                 |                                                                                                                                                                                            | SA, SB, SC                | 1,000   | A(C)  |   |
| Remark:                                         | * For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) of this Title.          |                           |         |       |   |
|                                                 | Aquatic Type standards apply to acid-soluble form.                                                                                                                                         |                           |         |       |   |

|                                        |                                                                                                                                       |     |       |     |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|-----|-------|-----|
| Bromacil<br>(314-40-9)                 | GA                                                                                                                                    | 4.4 | H(WS) | F   |
| Bromobenzene<br>(108-86-1)             | GA                                                                                                                                    | *   | H(WS) | J   |
| Remark:                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |     |       |     |
| Bromochloromethane<br>(74-97-5)        | A, A-S, AA, AA-S                                                                                                                      | 5   | H(WS) | I   |
|                                        | GA                                                                                                                                    | *   | H(WS) | J   |
| Remark:                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |     |       |     |
| Bromomethane<br>(74-83-9)              | A, A-S, AA, AA-S                                                                                                                      | 5   | H(WS) | I   |
|                                        | GA                                                                                                                                    | *   | H(WS) | J   |
| Remark:                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |     |       |     |
| Butachlor<br>(23184-66-9)              | GA                                                                                                                                    | 3.5 | H(WS) | F   |
| cis-2-Butenal<br>(15798-64-8)          | GA                                                                                                                                    | *   | H(WS) | J   |
| Remark:                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |     |       |     |
| trans-2-Butenal<br>(123-73-9)          | GA                                                                                                                                    | *   | H(WS) | J   |
| Remark:                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |     |       |     |
| cis-2-Butenenitrile<br>(1190-76-7)     | GA                                                                                                                                    | *   | H(WS) | J   |
| Remark:                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |     |       |     |
| trans-2-Butenenitrile<br>(627-26-9)    | GA                                                                                                                                    | *   | H(WS) | J   |
| Remark:                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |     |       |     |
| Butylate<br>(2008-41-5)                | GA                                                                                                                                    | 50  | H(WS) | J   |
| n-Butylbenzene<br>(104-51-8)           | A, A-S, AA, AA-S                                                                                                                      | 5   | H(WS) | I   |
|                                        | GA                                                                                                                                    | *   | H(WS) | J   |
| Remark:                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |     |       |     |
| sec-Butylbenzene<br>(135-98-8)         | A, A-S, AA, AA-S                                                                                                                      | 5   | H(WS) | I   |
|                                        | GA                                                                                                                                    | *   | H(WS) | J   |
| Remark:                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |     |       |     |
| tert-Butylbenzene<br>(98-06-6)         | A, A-S, AA, AA-S                                                                                                                      | 5   | H(WS) | I   |
|                                        | GA                                                                                                                                    | *   | H(WS) | J   |
| Remark:                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |     |       |     |
| Cadmium<br>(CAS No.<br>Not Applicable) | A, A-S, AA, AA-S                                                                                                                      | 5   | H(WS) | B,G |
|                                        | GA                                                                                                                                    | 5   | H(WS) | B,G |
|                                        | A, A-S, AA, AA-S, B, C                                                                                                                | *   | A(C)  |     |
|                                        | A, A-S, AA, AA-S, B, C, D                                                                                                             | **  | A(A)  |     |
|                                        | SA, SB, SC, I                                                                                                                         | 7.7 | A(C)  |     |
|                                        | SD                                                                                                                                    | 21  | A(A)  |     |
| Remarks:                               | * (0.85) exp(0.7852 [ln (ppm hardness)] - 2.715)                                                                                      |     |       |     |
|                                        | ** (0.85) exp(1.128 [ln (ppm hardness)] - 3.6867)                                                                                     |     |       |     |
|                                        | Aquatic Type standards apply to dissolved form.                                                                                       |     |       |     |
| Captan<br>(133-06-2)                   | GA                                                                                                                                    | 18  | H(WS) | F   |
| Carbaryl<br>(63-25-2)                  | GA                                                                                                                                    | 29  | H(WS) | F   |
| Carbofuran                             | A, A-S, AA, AA-S                                                                                                                      | 15  | H(WS) | B   |

|                                                             |                                                                                                                                                                                                                    |                           |                        |       |   |
|-------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|------------------------|-------|---|
| (1563-66-2)                                                 |                                                                                                                                                                                                                    | A, A-S, AA, AA-S, B, C    | 1.0 *                  | A(C)  |   |
|                                                             |                                                                                                                                                                                                                    | D                         | 10 *                   | A(A)  |   |
| Remark:                                                     | * For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) and (d) of this Title.                          |                           |                        |       |   |
| Carbon disulfide (75-15-0)                                  |                                                                                                                                                                                                                    | A, A-S, AA, AA-S          | 60                     | H(WS) | B |
| Carbon tetra-chloride                                       |                                                                                                                                                                                                                    | GA                        | 60                     | H(WS) | B |
| (56-23-5)                                                   |                                                                                                                                                                                                                    | GA                        | 5                      | H(WS) | F |
| Carboxin                                                    |                                                                                                                                                                                                                    | GA                        | 50                     | H(WS) | J |
| (5234-68-4)                                                 |                                                                                                                                                                                                                    |                           |                        |       |   |
| Chloramben                                                  |                                                                                                                                                                                                                    | GA                        | 50 *                   | H(WS) | J |
| (CAS No. Not Applicable)                                    |                                                                                                                                                                                                                    |                           |                        |       |   |
| Remark:                                                     | * Includes: related forms that convert to the organic acid upon acidification to a pH of 2 or less; and esters of the organic acid.                                                                                |                           |                        |       |   |
| Chloranil                                                   |                                                                                                                                                                                                                    | GA                        | *                      | H(WS) | J |
| (118-75-2)                                                  |                                                                                                                                                                                                                    |                           |                        |       |   |
| Remark:                                                     | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                                              |                           |                        |       |   |
| Chlordane (57-74-9)                                         |                                                                                                                                                                                                                    | A, A-S, AA, AA-S          | 0.05                   | H(WS) | A |
|                                                             |                                                                                                                                                                                                                    | GA                        | 0.05                   | H(WS) | A |
|                                                             |                                                                                                                                                                                                                    | A, A-S, AA, AA-S, B, C, D | $2 \times 10^{-5}$     | H(FC) | A |
|                                                             |                                                                                                                                                                                                                    | SA, SB, SC, I, SD         | $2 \times 10^{-5}$     | H(FC) | A |
| Chloride                                                    |                                                                                                                                                                                                                    | A, A-S, AA, AA-S          | 250,000                | H(WS) | H |
| (CAS No. Not Applicable)                                    |                                                                                                                                                                                                                    | GA                        | 250,000                | H(WS) | H |
| Chlorinated dibenzo-p-dioxins and Chlorinated dibenzofurans |                                                                                                                                                                                                                    | A, A-S, AA, AA-S          | $7 \times 10^{-7*}$    | H(WS) | A |
|                                                             |                                                                                                                                                                                                                    | GA                        | $7 \times 10^{-7*}$    | H(WS) | A |
| (CAS No. Not Applicable)                                    |                                                                                                                                                                                                                    | A, A-S, AA, AA-S, B, C, D | $6 \times 10^{-10*}$   | H(FC) | A |
|                                                             |                                                                                                                                                                                                                    | SA, SB, SC, I, SD         | $6 \times 10^{-10*}$   | H(FC) | A |
| Not Applicable)                                             |                                                                                                                                                                                                                    | A, A-S, AA, AA-S, B, C, D | $3.1 \times 10^{-9**}$ | W     |   |
|                                                             |                                                                                                                                                                                                                    | SA, SB, SC, I, SD         | $3.1 \times 10^{-9**}$ | W     |   |
| Remarks:                                                    | * Value is for the total of the chlorinated dibenzo-p-dioxins and chlorinated dibenzofurans that are listed in the table below as equivalents of 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD).               |                           |                        |       |   |
|                                                             | The 2,3,7,8-TCDD equivalent for a congener for the H(WS) standards is obtained by multiplying the concentration of that congener by its Toxicity Equivalency Factor (TEF) from the table below.                    |                           |                        |       |   |
|                                                             | The 2,3,7,8-TCDD equivalent for a congener for the H(FC) standards is obtained by multiplying the concentration of that congener by its TEF and its Bioaccumulation Equivalency Factor (BEF) from the table below. |                           |                        |       |   |
|                                                             | ** Applies only to 2,3,7,8-TCDD                                                                                                                                                                                    |                           |                        |       |   |

| CONGENER                               | TEF | BEF |
|----------------------------------------|-----|-----|
| 2,3,7,8-Tetrachlorodibenzo-p-dioxin    | 1   | 1   |
| 1,2,3,7,8-Pentachlorodibenzo-p-dioxin  | 0.5 | 0.9 |
| 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin | 0.1 | 0.3 |

|                                           |       |      |
|-------------------------------------------|-------|------|
| 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin    | 0.1   | 0.1  |
| 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin    | 0.1   | 0.1  |
| 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin | 0.01  | 0.05 |
| Octachlorodibenzo-p-dioxin                | 0.001 | 0.01 |
| 2,3,7,8-Tetrachlorodibenzofuran           | 0.1   | 0.8  |
| 1,2,3,7,8-Pentachlorodibenzofuran         | 0.05  | 0.2  |
| 2,3,4,7,8-Pentachlorodibenzofuran         | 0.5   | 1.6  |
| 1,2,3,4,7,8-Hexachlorodibenzofuran        | 0.1   | 0.08 |
| 1,2,3,6,7,8-Hexachlorodibenzofuran        | 0.1   | 0.2  |
| 2,3,4,6,7,8-Hexachlorodibenzofuran        | 0.1   | 0.7  |
| 1,2,3,7,8,9-Hexachlorodibenzofuran        | 0.1   | 0.6  |
| 1,2,3,4,6,7,8-Heptachlorodibenzofuran     | 0.01  | 0.01 |
| 1,2,3,4,7,8,9-Heptachlorodibenzofuran     | 0.01  | 0.4  |
| Octachlorodibenzofuran                    | 0.001 | 0.02 |

| SUBSTANCE<br>(CAS NO.)    |  |  | WATER CLASSES                                                                                                                         | STANDARD<br>(ug/L) | TYPE  | BASIS<br>CODE |
|---------------------------|--|--|---------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------|---------------|
| Chlorine, Total           |  |  | A, A-S, AA, AA-S, B, C                                                                                                                | 5                  | A(C)  |               |
| Residual                  |  |  | D                                                                                                                                     | 19                 | A(A)  |               |
| (CAS No.                  |  |  | SA, SB, SC, I                                                                                                                         | 7.5                | A(C)  |               |
| Not Applicable)           |  |  | SD                                                                                                                                    | 13                 | A(A)  |               |
| 2-Chloroaniline           |  |  | GA                                                                                                                                    | *                  | H(WS) | J             |
| (95-51-2)                 |  |  |                                                                                                                                       |                    |       |               |
| Remark:                   |  |  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                    |       |               |
| 3-Chloroaniline           |  |  | GA                                                                                                                                    | *                  | H(WS) | J             |
| (108-42-9)                |  |  |                                                                                                                                       |                    |       |               |
| Remark:                   |  |  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                    |       |               |
| 4-Chloroaniline           |  |  | GA                                                                                                                                    | *                  | H(WS) | J             |
| (106-47-8)                |  |  |                                                                                                                                       |                    |       |               |
| Remark:                   |  |  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                    |       |               |
| Chlorobenzene             |  |  | A, A-S, AA, AA-S                                                                                                                      | 5                  | H(WS) | I             |
| (108-90-7)                |  |  | GA                                                                                                                                    | *                  | H(WS) | J             |
|                           |  |  | A, A-S, AA, AA-S, B, C, D                                                                                                             | 400                | H(FC) | B             |
|                           |  |  | SA, SB, SC, I, SD                                                                                                                     | 400                | H(FC) | B             |
|                           |  |  | A, A-S, AA, AA-S, B, C                                                                                                                | 5                  | A(C)  |               |
|                           |  |  | A, A-S, AA, AA-S                                                                                                                      | 20                 | E(WS) | U             |
|                           |  |  | D                                                                                                                                     | 50                 | E(FS) | V             |
| Remark:                   |  |  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                    |       |               |
| 4-Chlorobenzotrifluoride  |  |  | A, A-S, AA, AA-S                                                                                                                      | 5                  | H(WS) | I             |
| (98-56-6)                 |  |  | GA                                                                                                                                    | *                  | H(WS) | J             |
| Remark:                   |  |  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                    |       |               |
| 1-Chlorobutane            |  |  | GA                                                                                                                                    | *                  | H(WS) | J             |
| (109-69-3)                |  |  |                                                                                                                                       |                    |       |               |
| Remark:                   |  |  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                    |       |               |
| Chloroethane              |  |  | GA                                                                                                                                    | *                  | H(WS) | J             |
| (75-00-3)                 |  |  |                                                                                                                                       |                    |       |               |
| Remark:                   |  |  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                    |       |               |
| Chloroform                |  |  | A, A-S, AA, AA-S                                                                                                                      | 7                  | H(WS) | A             |
| (67-66-3)                 |  |  | GA                                                                                                                                    | 7                  | H(WS) | A             |
| Chloromethyl methyl ether |  |  | GA                                                                                                                                    | *                  | H(WS) | J             |
| (107-30-2)                |  |  |                                                                                                                                       |                    |       |               |
| Remark:                   |  |  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                    |       |               |
| 2-Chloronaphthalene       |  |  | A, A-S, AA, AA-S                                                                                                                      | 10                 | E(WS) | U             |
| (91-58-7)                 |  |  |                                                                                                                                       |                    |       |               |
| 2-Chloronitrobenzene      |  |  | GA                                                                                                                                    | *                  | H(WS) | J             |

|                                  |                                                                                                                                       |                           |          |       |   |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------|-------|---|
| (88-73-3)                        |                                                                                                                                       |                           |          |       |   |
| Remark:                          | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                           |          |       |   |
| 3-Chloronitrobenzene             |                                                                                                                                       | GA                        | *        | H(WS) | J |
| (121-73-3)                       |                                                                                                                                       |                           |          |       |   |
| Remark:                          | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                           |          |       |   |
| 4-Chloronitrobenzene             |                                                                                                                                       | GA                        | *        | H(WS) | J |
| (100-00-5)                       |                                                                                                                                       |                           |          |       |   |
| Remark:                          | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                           |          |       |   |
| Chloroprene                      |                                                                                                                                       | GA                        | *        | H(WS) | J |
| (126-99-8)                       |                                                                                                                                       |                           |          |       |   |
| Remark:                          | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                           |          |       |   |
| Chlorothalonil                   |                                                                                                                                       | GA                        | *        | H(WS) | J |
| (1897-45-6)                      |                                                                                                                                       |                           |          |       |   |
| Remark:                          | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                           |          |       |   |
| 2-Chlorotoluene                  |                                                                                                                                       | A, A-S, AA, AA-S          | 5        | H(WS) | I |
| (95-49-8)                        |                                                                                                                                       | GA                        | *        | H(WS) | J |
| Remark:                          | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                           |          |       |   |
| 3-Chlorotoluene                  |                                                                                                                                       | A, A-S, AA, AA-S          | 5        | H(WS) | I |
| (108-41-8)                       |                                                                                                                                       | GA                        | *        | H(WS) | J |
| Remark:                          | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                           |          |       |   |
| 4-Chlorotoluene                  |                                                                                                                                       | A, A-S, AA, AA-S          | 5        | H(WS) | I |
| (106-43-4)                       |                                                                                                                                       | GA                        | *        | H(WS) | J |
| Remark:                          | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                           |          |       |   |
| 4-Chloro-o-toluidine             |                                                                                                                                       | GA                        | *        | H(WS) | J |
| (95-69-2)                        |                                                                                                                                       |                           |          |       |   |
| Remark:                          | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                           |          |       |   |
| 5-Chloro-o-toluidine             |                                                                                                                                       | GA                        | *        | H(WS) | J |
| (95-79-4)                        |                                                                                                                                       |                           |          |       |   |
| Remark:                          | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                           |          |       |   |
| 3-Chloro-1,1,1-tri-fluoropropane |                                                                                                                                       | A, A-S, AA, AA-S          | 5        | H(WS) | I |
| (460-35-5)                       |                                                                                                                                       | GA                        | *        | H(WS) | J |
| Remark:                          | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                           |          |       |   |
| Chromium                         |                                                                                                                                       | A, A-S, AA, AA-S          | 50       | H(WS) | G |
| (CAS No.                         |                                                                                                                                       | GA                        | 50       | H(WS) | G |
| Not Applicable)                  |                                                                                                                                       | A, A-S, AA, AA-S, B, C    | *        | A(C)  |   |
|                                  |                                                                                                                                       | A, A-S, AA, AA-S, B, C, D | **       | A(A)  |   |
| Remarks:                         | * $(0.86) \exp(0.819 [\ln (\text{ppm hardness})] + 0.6848)$                                                                           |                           |          |       |   |
|                                  | ** $(0.316) \exp(0.819 [\ln (\text{ppm hardness})] + 3.7256)$                                                                         |                           |          |       |   |
|                                  | Aquatic Type standards apply to dissolved form and do not include hexavalent chromium.                                                |                           |          |       |   |
| Chromium                         |                                                                                                                                       | GA                        | 50       | H(WS) | F |
| (hexavalent)                     |                                                                                                                                       | A, A-S, AA, AA-S, B, C    | 11 *     | A(C)  |   |
| (CAS No.                         |                                                                                                                                       | A, A-S, AA, AA-S, B, C, D | 16 *     | A(A)  |   |
| Not Applicable)                  |                                                                                                                                       | SA, SB, SC                | 54 **    | A(C)  |   |
|                                  |                                                                                                                                       | SD                        | 1,200 ** | A(A)  |   |



|                          |                                                                                                                                                                                   |  |                    |       |   |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--------------------|-------|---|
| Remarks:                 | * Applies to dissolved form.                                                                                                                                                      |  |                    |       |   |
|                          | ** Applies to acid-soluble form.                                                                                                                                                  |  |                    |       |   |
| Cobalt                   | A, A-S, AA, AA-S, B, C                                                                                                                                                            |  | 5 *                | A(C)  |   |
| (CAS No. Not Applicable) |                                                                                                                                                                                   |  |                    |       |   |
| Remark:                  | * For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) of this Title. |  |                    |       |   |
|                          | Aquatic Type standards apply to acid-soluble form.                                                                                                                                |  |                    |       |   |
| Copper                   | A, A-S, AA, AA-S                                                                                                                                                                  |  | 200                | H(WS) | H |
| (CAS No.                 | GA                                                                                                                                                                                |  | 200                | H(WS) | H |
| Not Applicable)          | A, A-S, AA, AA-S, B, C                                                                                                                                                            |  | *                  | A(C)  |   |
|                          | A, A-S, AA, AA-S, B, C, D                                                                                                                                                         |  | **                 | A(A)  |   |
|                          | SA, SB, SC, I                                                                                                                                                                     |  | ***                | A(C)  |   |
|                          | SA, SB, SC, I, SD                                                                                                                                                                 |  | ****               | A(A)  |   |
|                          | * (0.96) exp(0.8545 [ln (ppm hardness)] - 1.702)                                                                                                                                  |  |                    |       |   |
|                          | ** (0.96) exp(0.9422 [ln (ppm hardness)] - 1.7)                                                                                                                                   |  |                    |       |   |
|                          | *** Standard is 3.4 ug/L except in New York/New Jersey harbor where it is 5.6 ug/L.                                                                                               |  |                    |       |   |
|                          | **** Standard is 4.8 ug/L except in New York/New Jersey harbor where it is 7.9 ug/L.                                                                                              |  |                    |       |   |
|                          | Aquatic Type standards apply to dissolved form.                                                                                                                                   |  |                    |       |   |
| Cyanide                  | A, A-S, AA, AA-S                                                                                                                                                                  |  | 200                | H(WS) | B |
| (CAS No.                 | GA                                                                                                                                                                                |  | 200                | H(WS) | B |
| Not Applicable)          | A, A-S, AA, AA-S, B, C, D                                                                                                                                                         |  | 9,000              | H(FC) | B |
|                          | SA, SB, SC, I, SD                                                                                                                                                                 |  | 9,000              | H(FC) | B |
|                          | A, A-S, AA, AA-S, B, C                                                                                                                                                            |  | 5.2 *              | A(C)  |   |
|                          | A, A-S, AA, AA-S, B, C, D                                                                                                                                                         |  | 22 *               | A(A)  |   |
|                          | SA, SB, SC                                                                                                                                                                        |  | 1.0 *              | A(C)  |   |
|                          | SD                                                                                                                                                                                |  | 1.0 *              | A(A)  |   |
| Remark:                  | * As free cyanide: the sum of HCN and CN <sup>-</sup> expressed as CN.                                                                                                            |  |                    |       |   |
| Cyanogen bromide         | GA                                                                                                                                                                                |  | *                  | H(WS) | J |
| (506-68-3)               |                                                                                                                                                                                   |  |                    |       |   |
| Remark:                  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |  |                    |       |   |
| Cyanogen chloride        | GA                                                                                                                                                                                |  | *                  | H(WS) | J |
| (506-77-4)               |                                                                                                                                                                                   |  |                    |       |   |
| Remark:                  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |  |                    |       |   |
| Dalapon                  | GA                                                                                                                                                                                |  | 50 *               | H(WS) | J |
| (CAS No. Not Applicable) |                                                                                                                                                                                   |  |                    |       |   |
| Remark:                  | * Includes: related forms that convert to the organic acid upon acidification to a pH of 2 or less; and esters of the organic acid.                                               |  |                    |       |   |
| p,p'-DDD                 | A, A-S, AA, AA-S                                                                                                                                                                  |  | 0.3                | H(WS) | A |
| (72-54-8)                | GA                                                                                                                                                                                |  | 0.3                | H(WS) | A |
|                          | A, A-S, AA, AA-S, B, C, D                                                                                                                                                         |  | $8 \times 10^{-5}$ | H(FC) | A |
|                          | SA, SB, SC, I, SD                                                                                                                                                                 |  | $8 \times 10^{-5}$ | H(FC) | A |
|                          | A, A-S, AA, AA-S, B, C, D                                                                                                                                                         |  | *                  | W     |   |
|                          | SA, SB, SC, I, SD                                                                                                                                                                 |  | *                  | W     |   |
| Remark:                  | * See standard for p,p'-DDT.                                                                                                                                                      |  |                    |       |   |
| p,p'-DDE                 | A, A-S, AA, AA-S                                                                                                                                                                  |  | 0.2                | H(WS) | A |
| (72-55-9)                | GA                                                                                                                                                                                |  | 0.2                | H(WS) | A |
|                          | A, A-S, AA, AA-S, B, C, D                                                                                                                                                         |  | $7 \times 10^{-6}$ | H(FC) | A |
|                          | SA, SB, SC, I, SD                                                                                                                                                                 |  | $7 \times 10^{-6}$ | H(FC) | A |
|                          | A, A-S, AA, AA-S, B, C, D                                                                                                                                                         |  | *                  | W     |   |
|                          | SA, SB, SC, I, SD                                                                                                                                                                 |  | *                  | W     |   |
| Remark:                  | * See standard for p,p'-DDT.                                                                                                                                                      |  |                    |       |   |
| p,p'-DDT                 | A, A-S, AA, AA-S                                                                                                                                                                  |  | 0.2                | H(WS) | A |

|                             |                                                                                                                                                                                   |                           |                        |       |   |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|------------------------|-------|---|
| (50-29-3)                   |                                                                                                                                                                                   | GA                        | 0.2                    | H(WS) | A |
|                             |                                                                                                                                                                                   | A, A-S, AA, AA-S, B, C, D | $1 \times 10^{-5}$     | H(FC) | A |
|                             |                                                                                                                                                                                   | SA, SB, SC, I, SD         | $1 \times 10^{-5}$     | H(FC) | A |
|                             |                                                                                                                                                                                   | A, A-S, AA, AA-S, B, C, D | $1.1 \times 10^{-5}$ * | W     |   |
|                             |                                                                                                                                                                                   | SA, SB, SC, I, SD         | $1.1 \times 10^{-5}$ * | W     |   |
| Remark:                     | * Applies to the sum of p,p'-DDD, p,p' -DDE and p,p'-DDT.                                                                                                                         |                           |                        |       |   |
| Dechlorane Plus             |                                                                                                                                                                                   | A, A-S, AA, AA-S          | 5                      | H(WS) | I |
| (13560-89-9)                |                                                                                                                                                                                   | GA                        | *                      | H(WS) | J |
| Remark:                     | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |                           |                        |       |   |
| Demeton                     |                                                                                                                                                                                   | A, A-S, AA, AA-S, B, C    | 0.1 *                  | A(C)  |   |
| (8065-48-3;                 |                                                                                                                                                                                   | SA, SB, SC                | 0.1                    | A(C)  |   |
| 298-03-3;                   |                                                                                                                                                                                   |                           |                        |       |   |
| 126-75-0)                   |                                                                                                                                                                                   |                           |                        |       |   |
| Remark:                     | * For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) of this Title. |                           |                        |       |   |
|                             | Standards apply to the sum of these substances.                                                                                                                                   |                           |                        |       |   |
| Diazinon                    |                                                                                                                                                                                   | GA                        | 0.7                    | H(WS) | F |
| (333-41-5)                  |                                                                                                                                                                                   | A, A-S, AA, AA-S, B, C    | 0.08 *                 | A(C)  |   |
| Remark:                     | * For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) of this Title. |                           |                        |       |   |
| 1,2-Dibromobenzene          |                                                                                                                                                                                   | A, A-S, AA, AA-S          | 5                      | H(WS) | I |
| (583-53-9)                  |                                                                                                                                                                                   | GA                        | *                      | H(WS) | J |
| Remark:                     | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |                           |                        |       |   |
| 1,3-Dibromobenzene          |                                                                                                                                                                                   | A, A-S, AA, AA-S          | 5                      | H(WS) | I |
| (108-36-1)                  |                                                                                                                                                                                   | GA                        | *                      | H(WS) | J |
| Remark:                     | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |                           |                        |       |   |
| 1,4-Dibromobenzene          |                                                                                                                                                                                   | A, A-S, AA, AA-S          | 5                      | H(WS) | I |
| (106-37-6)                  |                                                                                                                                                                                   | GA                        | *                      | H(WS) | J |
| Remark:                     | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |                           |                        |       |   |
| 1,2-Dibromo-3-chloropropane |                                                                                                                                                                                   | A, A-S, AA, AA-S          | 0.04                   | H(WS) | A |
| (96-12-8)                   |                                                                                                                                                                                   | GA                        | 0.04                   | H(WS) | A |
| Dibromodichloromethane      |                                                                                                                                                                                   | A, A-S, AA, AA-S          | 5                      | H(WS) | I |
| (594-18-3)                  |                                                                                                                                                                                   | GA                        | *                      | H(WS) | J |
| Remark:                     | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |                           |                        |       |   |
| Dibromomethane              |                                                                                                                                                                                   | GA                        | *                      | H(WS) | J |
| (74-95-3)                   |                                                                                                                                                                                   |                           |                        |       |   |
| Remark:                     | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |                           |                        |       |   |
| Di-n-butyl phthalate        |                                                                                                                                                                                   | GA                        | 50                     | H(WS) | J |
| (84-74-2)                   |                                                                                                                                                                                   |                           |                        |       |   |
| Dicamba                     |                                                                                                                                                                                   | GA                        | 0.44                   | H(WS) | F |
| (1918-00-9)                 |                                                                                                                                                                                   |                           |                        |       |   |
| Dichlorobenzenes            |                                                                                                                                                                                   | A, A-S, AA, AA-S          | 3 *                    | H(WS) | A |
| (95-50-1; 541-73-1;         |                                                                                                                                                                                   | GA                        | 3 *                    | H(WS) | A |
| 106-46-7)                   |                                                                                                                                                                                   | A, A-S, AA, AA-S, B, C    | 5 **                   | A(C)  |   |
|                             |                                                                                                                                                                                   | A, A-S, AA, AA-S          | 20 *** /30 ****        | E(WS) | U |
|                             |                                                                                                                                                                                   | D                         | 50 **                  | E(FS) | V |
| Remarks:                    | * Applies to each isomer (1,2-,1,3- and 1,4-dichlorobenzene) individually.                                                                                                        |                           |                        |       |   |
|                             | ** Applies to the sum of 1,2-, 1,3- and 1,4-dichlorobenzene.                                                                                                                      |                           |                        |       |   |
|                             | For the waters of the Great Lakes System,                                                                                                                                         |                           |                        |       |   |

|                                                 |                                                                                                                                       |                                      |             |                |        |
|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-------------|----------------|--------|
|                                                 | the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) of this Title. |                                      |             |                |        |
|                                                 | ***                                                                                                                                   | Applies to 1,3-dichlorobenzene only. |             |                |        |
|                                                 | ****                                                                                                                                  | Applies to 1,4-dichlorobenzene only. |             |                |        |
| 3,3'-Dichlorobenzidine<br>(91-94-1)             |                                                                                                                                       | GA                                   | *           | H(WS)          | J      |
| Remark:                                         | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                                      |             |                |        |
| 3,4-Dichlorobenzo-<br>trifluoride<br>(328-84-7) |                                                                                                                                       | A, A-S, AA, AA-S<br>GA               | 5<br>*      | H(WS)<br>H(WS) | I<br>J |
| Remark:                                         | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                                      |             |                |        |
| cis-1,4-Dichloro-2-butene<br>(1476-11-5)        |                                                                                                                                       | GA                                   | *           | H(WS)          | J      |
| Remark:                                         | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                                      |             |                |        |
| trans-1,4-Dichloro-2-butene<br>(110-57-6)       |                                                                                                                                       | GA                                   | *           | H(WS)          | J      |
| Remark:                                         | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                                      |             |                |        |
| Dichlorodifluoromethane<br>(75-71-8)            |                                                                                                                                       | GA                                   | *           | H(WS)          | J      |
| Remark:                                         | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                                      |             |                |        |
| 1,1-Dichloroethane<br>(75-34-3)                 |                                                                                                                                       | A, A-S, AA, AA-S<br>GA               | 5<br>*      | H(WS)<br>H(WS) | I<br>J |
| Remark:                                         | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                                      |             |                |        |
| 1,2-Dichloroethane<br>(107-06-2)                |                                                                                                                                       | A, A-S, AA, AA-S<br>GA               | 0.6<br>0.6  | H(WS)<br>H(WS) | A<br>A |
| 1,1-Dichloroethene<br>(75-35-4)                 |                                                                                                                                       | GA                                   | *           | H(WS)          | J      |
| Remark:                                         | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                                      |             |                |        |
| cis-1,2-Dichloroethene<br>(156-59-2)            |                                                                                                                                       | A, A-S, AA, AA-S<br>GA               | 5<br>*      | H(WS)<br>H(WS) | I<br>J |
| Remark:                                         | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                                      |             |                |        |
| trans-1,2-Dichloroethene<br>(156-60-5)          |                                                                                                                                       | A, A-S, AA, AA-S<br>GA               | 5<br>*      | H(WS)<br>H(WS) | I<br>J |
| Remark:                                         | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                                      |             |                |        |
| Dichlorofluoromethane<br>(75-43-4)              |                                                                                                                                       | A, A-S, AA, AA-S<br>GA               | 5<br>*      | H(WS)<br>H(WS) | I<br>J |
| Remark:                                         | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                                      |             |                |        |
| 2,4-Dichlorophenol<br>(120-83-2)                |                                                                                                                                       | A, A-S, AA, AA-S<br>GA               | 0.3 *<br>** | E(WS)<br>E(WS) | U      |
|                                                 |                                                                                                                                       | A, A-S, AA, AA-S, B, C, D            | ***         | E(FS)          |        |
| Remarks:                                        | * Also see standards for "Phenolic compounds (total phenols)."                                                                        |                                      |             |                |        |
|                                                 | ** Refer to standards for "Phenolic compounds (total phenols)."                                                                       |                                      |             |                |        |
|                                                 | *** Refer to standards for "Phenols, total chlorinated."                                                                              |                                      |             |                |        |
| 2,4-Dichloro-<br>phenoxyacetic<br>acid          |                                                                                                                                       | A, A-S, AA, AA-S<br>GA               | 50<br>50    | H(WS)<br>H(WS) | G<br>G |

|                                        |                                                                                                                                       |                    |       |   |  |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------|---|--|
| (94-75-7)                              |                                                                                                                                       |                    |       |   |  |
| 1,1-Dichloropropane                    | A, A-S, AA, AA-S                                                                                                                      | 5                  | H(WS) | I |  |
| (78-99-9)                              | GA                                                                                                                                    | *                  | H(WS) | J |  |
| Remark:                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                    |       |   |  |
| 1,2-Dichloropropane                    | A, A-S, AA, AA-S                                                                                                                      | 1                  | H(WS) | A |  |
| (78-87-5)                              | GA                                                                                                                                    | 1                  | H(WS) | A |  |
| 1,3-Dichloropropane                    | A, A-S, AA, AA-S                                                                                                                      | 5                  | H(WS) | I |  |
| (142-28-9)                             | GA                                                                                                                                    | *                  | H(WS) | J |  |
| Remark:                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                    |       |   |  |
| 2,2-Dichloropropane                    | A, A-S, AA, AA-S                                                                                                                      | 5                  | H(WS) | I |  |
| (594-20-7)                             | GA                                                                                                                                    | *                  | H(WS) | J |  |
| Remark:                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                    |       |   |  |
| 1,3-Dichloropropene                    | A, A-S, AA, AA-S                                                                                                                      | 0.4 *              | H(WS) | A |  |
| (542-75-6)                             | GA                                                                                                                                    | 0.4 *              | H(WS) | A |  |
| Remark:                                | * Applies to the sum of cis- and trans-1,3-dichloropropene, CAS Nos. 10061-01-5 and 10061-02-6, respectively.                         |                    |       |   |  |
| 2,3-Dichlorotoluene                    | A, A-S, AA, AA-S                                                                                                                      | 5                  | H(WS) | I |  |
| (32768-54-0)                           | GA                                                                                                                                    | *                  | H(WS) | J |  |
| Remark:                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                    |       |   |  |
| 2,4-Dichlorotoluene                    | A, A-S, AA, AA-S                                                                                                                      | 5                  | H(WS) | I |  |
| (95-73-8)                              | GA                                                                                                                                    | *                  | H(WS) | J |  |
| Remark:                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                    |       |   |  |
| 2,5-Dichlorotoluene                    | A, A-S, AA, AA-S                                                                                                                      | 5                  | H(WS) | I |  |
| (19398-61-9)                           | GA                                                                                                                                    | *                  | H(WS) | J |  |
| Remark:                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                    |       |   |  |
| 2,6-Dichlorotoluene                    | A, A-S, AA, AA-S                                                                                                                      | 5                  | H(WS) | I |  |
| (118-69-4)                             | GA                                                                                                                                    | *                  | H(WS) | J |  |
| Remark:                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                    |       |   |  |
| 3,4-Dichlorotoluene                    | A, A-S, AA, AA-S                                                                                                                      | 5                  | H(WS) | I |  |
| (95-75-0)                              | GA                                                                                                                                    | *                  | H(WS) | J |  |
| Remark:                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                    |       |   |  |
| 3,5-Dichlorotoluene                    | A, A-S, AA, AA-S                                                                                                                      | 5                  | H(WS) | I |  |
| (25186-47-4)                           | GA                                                                                                                                    | *                  | H(WS) | J |  |
| Remark:                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                    |       |   |  |
| Dieldrin                               | A, A-S, AA, AA-S                                                                                                                      | 0.004              | H(WS) | A |  |
| (60-57-1)                              | GA                                                                                                                                    | 0.004              | H(WS) | A |  |
|                                        | A, A-S, AA, AA-S, B, C, D                                                                                                             | $6 \times 10^{-7}$ | H(FC) | A |  |
|                                        | SA, SB, SC, I, SD                                                                                                                     | $6 \times 10^{-7}$ | H(FC) | A |  |
|                                        | A, A-S, AA, AA-S, B, C                                                                                                                | 0.056              | A(C)  |   |  |
|                                        | A, A-S, AA, AA-S, B, C, D                                                                                                             | 0.24               | A(A)  |   |  |
| Di(2-ethylhexyl)adipate                | A, A-S, AA, AA-S                                                                                                                      | 20                 | H(WS) | A |  |
| (103-23-1)                             | GA                                                                                                                                    | 20                 | H(WS) | A |  |
| 1,2-Difluoro-1,1,2,2-tetrachloroethane | GA                                                                                                                                    | *                  | H(WS) | J |  |
| (76-12-0)                              |                                                                                                                                       |                    |       |   |  |
| Remark:                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                    |       |   |  |
| 1,2-Diisopropylbenzene                 | GA                                                                                                                                    | *                  | H(WS) | J |  |
| (577-55-9)                             |                                                                                                                                       |                    |       |   |  |
| Remark:                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |                    |       |   |  |
| 1,3-Diisopropylbenzene                 | GA                                                                                                                                    | *                  | H(WS) | J |  |

|                        |  |                                                                                                                                       |       |       |   |
|------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------|-------|-------|---|
| (99-62-7)              |  |                                                                                                                                       |       |       |   |
| Remark:                |  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |       |       |   |
| 1,4-Diisopropylbenzene |  | GA                                                                                                                                    | *     | H(WS) | J |
| (100-18-5)             |  |                                                                                                                                       |       |       |   |
| Remark:                |  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |       |       |   |
| N,N-Dimethylaniline    |  | A, A-S, AA, AA-S                                                                                                                      | 1     | H(WS) | A |
| (121-69-7)             |  | GA                                                                                                                                    | 1     | H(WS) | A |
| 2,3-Dimethylaniline    |  | GA                                                                                                                                    | *     | H(WS) | J |
| (87-59-2)              |  |                                                                                                                                       |       |       |   |
| Remark:                |  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |       |       |   |
| 2,4-Dimethylaniline    |  | GA                                                                                                                                    | *     | H(WS) | J |
| (95-68-1)              |  |                                                                                                                                       |       |       |   |
| Remark:                |  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |       |       |   |
| 2,5-Dimethylaniline    |  | GA                                                                                                                                    | *     | H(WS) | J |
| (95-78-3)              |  |                                                                                                                                       |       |       |   |
| Remark:                |  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |       |       |   |
| 2,6-Dimethylaniline    |  | GA                                                                                                                                    | *     | H(WS) | J |
| (87-62-7)              |  |                                                                                                                                       |       |       |   |
| Remark:                |  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |       |       |   |
| 3,4-Dimethylaniline    |  | GA                                                                                                                                    | *     | H(WS) | J |
| (95-64-7)              |  |                                                                                                                                       |       |       |   |
| Remark:                |  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |       |       |   |
| 3,5-Dimethylaniline    |  | GA                                                                                                                                    | *     | H(WS) | J |
| (108-69-0)             |  |                                                                                                                                       |       |       |   |
| Remark:                |  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |       |       |   |
| 3,3'-Dimethylbenzidine |  | GA                                                                                                                                    | *     | H(WS) | J |
| (119-93-7)             |  |                                                                                                                                       |       |       |   |
| Remark:                |  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |       |       |   |
| 4,4'-Dimethylbibenzyl  |  | GA                                                                                                                                    | *     | H(WS) | J |
| (538-39-6)             |  |                                                                                                                                       |       |       |   |
| Remark:                |  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |       |       |   |
| 4,4'-Dimethyldiphenyl- |  | GA                                                                                                                                    | *     | H(WS) | J |
| methane                |  |                                                                                                                                       |       |       |   |
| (4957-14-6)            |  |                                                                                                                                       |       |       |   |
| Remark:                |  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |       |       |   |
| alpha, alpha-Dimethyl  |  | GA                                                                                                                                    | *     | H(WS) | J |
| phenethylamine         |  |                                                                                                                                       |       |       |   |
| (122-09-8)             |  |                                                                                                                                       |       |       |   |
| Remark:                |  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |       |       |   |
| 2,4-Dimethylphenol     |  | A, A-S, AA, AA-S, B, C, D                                                                                                             | 1,000 | H(FC) | B |
| (105-67-9)             |  | SA, SB, SC, I, SD                                                                                                                     | 1,000 | H(FC) | B |
|                        |  | A, A-S, AA, AA-S                                                                                                                      | *     | E(WS) |   |
|                        |  | GA                                                                                                                                    | *     | E(WS) |   |
|                        |  | A, A-S, AA, AA-S, B, C, D                                                                                                             | **    | E(FS) |   |
| Remarks:               |  | * Refer to standards for "Phenolic compounds (total phenols)."                                                                        |       |       |   |
|                        |  | ** Refer to standards for "Phenols, total unchlorinated."                                                                             |       |       |   |
| Dimethyl tetrachloro-  |  | GA                                                                                                                                    | 50    | H(WS) | J |
| terephthalate          |  |                                                                                                                                       |       |       |   |
| (1861-32-1)            |  |                                                                                                                                       |       |       |   |

|                                                    |                                                                                                                                                                                   |        |       |   |
|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------|---|
| 1,3-Dinitrobenzene<br>(99-65-0)                    | GA                                                                                                                                                                                | *      | H(WS) | J |
| Remark:                                            | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |        |       |   |
| 2,4-Dinitrophenol<br>(51-28-5)                     | A, A-S, AA, AA-S, B, C, D                                                                                                                                                         | 400    | H(FC) | B |
|                                                    | SA, SB, SC, I, SD                                                                                                                                                                 | 400    | H(FC) | B |
|                                                    | A, A-S, AA, AA-S                                                                                                                                                                  | *      | E(WS) |   |
|                                                    | GA                                                                                                                                                                                | *      | E(WS) |   |
|                                                    | A, A-S, AA, AA-S, B, C, D                                                                                                                                                         | **     | E(FS) |   |
| Remarks:                                           | * Refer to standards for "Phenolic compounds (total phenols)."                                                                                                                    |        |       |   |
|                                                    | ** Refer to standards for "Phenols, total unchlorinated."                                                                                                                         |        |       |   |
| 2,3-Dinitrotoluene<br>(602-01-7)                   | GA                                                                                                                                                                                | *      | H(WS) | J |
| Remark:                                            | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |        |       |   |
| 2,4-Dinitrotoluene<br>(121-14-2)                   | GA                                                                                                                                                                                | *      | H(WS) | J |
| Remark:                                            | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |        |       |   |
| 2,5-Dinitrotoluene<br>(619-15-8)                   | GA                                                                                                                                                                                | *      | H(WS) | J |
| Remark:                                            | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |        |       |   |
| 2,6-Dinitrotoluene<br>(606-20-2)                   | GA                                                                                                                                                                                | *      | H(WS) | J |
| Remark:                                            | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |        |       |   |
| 3,4-Dinitrotoluene<br>(610-39-9)                   | GA                                                                                                                                                                                | *      | H(WS) | J |
| Remark:                                            | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |        |       |   |
| 3,5-Dinitrotoluene<br>(618-85-9)                   | GA                                                                                                                                                                                | *      | H(WS) | J |
| Remark:                                            | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |        |       |   |
| Diphenamid<br>(957-51-7)                           | GA                                                                                                                                                                                | 50     | H(WS) | J |
| Diphenylamine<br>(122-39-4)                        | GA                                                                                                                                                                                | *      | H(WS) | J |
| Remark:                                            | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |        |       |   |
| Diphenyl-<br>hydrazines<br>(122-66-7;<br>530-50-7) | GA                                                                                                                                                                                | ND *   | H(WS) | F |
| Remark:                                            | * Applies to the sum of 1,1- and 1,2-diphenylhydrazine, CAS Nos. 530-50-7 and 122-66-7, respectively.                                                                             |        |       |   |
| Diquat<br>(2764-72-9)                              | A, A-S, AA, AA-S                                                                                                                                                                  | 20 *   | H(WS) | B |
|                                                    | GA                                                                                                                                                                                | 20 *   | H(WS) | B |
| Remark:                                            | * Applies to the concentration of diquat ion whether free or as an undissociated salt.                                                                                            |        |       |   |
| Disulfoton<br>(298-04-4)                           | GA                                                                                                                                                                                | *      | H(WS) |   |
| Remark:                                            | * Refer to standards for "Phorate and Disulfoton."                                                                                                                                |        |       |   |
| Dyphylline<br>(479-18-5)                           | A, A-S, AA, AA-S                                                                                                                                                                  | 50     | H(WS) | B |
| Endosulfan<br>(115-29-7)                           | A, A-S, AA, AA-S, B, C                                                                                                                                                            | 0.009  | A(C)  |   |
|                                                    | D                                                                                                                                                                                 | 0.22 * | A(A)  |   |
|                                                    | SA, SB, SC                                                                                                                                                                        | 0.001  | A(C)  |   |
|                                                    | SD                                                                                                                                                                                | 0.034  | A(A)  |   |
| Remark:                                            | * For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(d) of this Title. |        |       |   |

|                                            |                                                                                                                                                                                         |                           |                    |       |   |
|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|--------------------|-------|---|
| Endrin<br>(72-20-8)                        |                                                                                                                                                                                         | A, A-S, AA, AA-S          | 0.2                | H(WS) | G |
|                                            |                                                                                                                                                                                         | GA                        | ND                 | H(WS) | F |
|                                            |                                                                                                                                                                                         | A, A-S, AA, AA-S, B, C, D | 0.002              | H(FC) |   |
|                                            |                                                                                                                                                                                         | SA, SB, SC, SD            | 0.002              | H(FC) |   |
|                                            |                                                                                                                                                                                         | A, A-S, AA, AA-S, B, C    | 0.036              | A(C)  |   |
|                                            |                                                                                                                                                                                         | A, A-S, AA, AA-S, B, C, D | 0.086              | A(A)  |   |
| Endrin aldehyde<br>(7421-93-4)             |                                                                                                                                                                                         | GA                        | *                  | H(WS) | J |
| Remark:                                    | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                   |                           |                    |       |   |
| Endrin ketone<br>(53494-70-5)              |                                                                                                                                                                                         | GA                        | *                  | H(WS) | J |
| Remark:                                    | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                   |                           |                    |       |   |
| Ethylbenzene<br>(100-41-4)                 |                                                                                                                                                                                         | A, A-S, AA, AA-S          | 5                  | H(WS) | I |
|                                            |                                                                                                                                                                                         | GA                        | *                  | H(WS) | J |
| Remark:                                    | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                   |                           |                    |       |   |
| Ethylene dibromide<br>(106-93-4)           |                                                                                                                                                                                         | A, A-S, AA, AA-S          | $6 \times 10^{-4}$ | H(WS) | A |
|                                            |                                                                                                                                                                                         | GA                        | $6 \times 10^{-4}$ | H(WS) | A |
| Ethylenethiourea<br>(96-45-7)              |                                                                                                                                                                                         | GA                        | ND                 | H(WS) | F |
| Ferbam<br>(14484-64-1)                     |                                                                                                                                                                                         | GA                        | 4.2                | H(WS) | F |
| Fluometuron<br>(2164-17-2)                 |                                                                                                                                                                                         | GA                        | 50                 | H(WS) | J |
| Fluoride<br>(CAS No.                       |                                                                                                                                                                                         | A, A-S, AA, AA-S          | 1,500              | H(WS) | H |
| Not Applicable)                            |                                                                                                                                                                                         | GA                        | 1,500              | H(WS) | F |
|                                            |                                                                                                                                                                                         | A, A-S, AA, AA-S, B, C    | *                  | A(C)  |   |
|                                            |                                                                                                                                                                                         | D                         | **                 | A(A)  |   |
| Remarks:                                   | * (0.02) exp(0.907 [ln (ppm hardness)]) + 7.394)                                                                                                                                        |                           |                    |       |   |
|                                            | ** (0.1) exp(0.907 [ln (ppm hardness)]) + 7.394)                                                                                                                                        |                           |                    |       |   |
|                                            | For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) and (d) of this Title. |                           |                    |       |   |
| Foaming agents<br>(CAS No. Not Applicable) |                                                                                                                                                                                         | GA                        | 500 *              | E(WS) | U |
| Remark:                                    | * Determined as methylene blue active substances (MBAS) or by other tests as specified by the commissioner.                                                                             |                           |                    |       |   |
| Folpet<br>(133-07-3)                       |                                                                                                                                                                                         | GA                        | 50                 | H(WS) | J |
| Formaldehyde<br>(50-00-0)                  |                                                                                                                                                                                         | A, A-S, AA, AA-S          | 8                  | H(WS) | A |
|                                            |                                                                                                                                                                                         | GA                        | 8                  | H(WS) | A |
| Gross alpha<br>radiation                   |                                                                                                                                                                                         | A, A-S, AA, AA-S          | *                  | H(WS) | G |
|                                            |                                                                                                                                                                                         | GA                        | *                  | H(WS) | G |
| (CAS No. Not Applicable)                   |                                                                                                                                                                                         |                           |                    |       |   |
| Remark:                                    | * 15 picocuries per liter, excluding radon and uranium.                                                                                                                                 |                           |                    |       |   |
| Gross beta<br>radiation                    |                                                                                                                                                                                         | A, AA                     | *                  | H(WS) | H |
|                                            |                                                                                                                                                                                         | GA                        | *                  | H(WS) | H |
| (CAS No. Not Applicable)                   |                                                                                                                                                                                         |                           |                    |       |   |
| Remark:                                    | * 1,000 picocuries per liter, excluding strontium-90 and alpha emitters.                                                                                                                |                           |                    |       |   |
| Heptachlor<br>(76-44-8)                    |                                                                                                                                                                                         | A, A-S, AA, AA-S          | 0.04               | H(WS) | A |
|                                            |                                                                                                                                                                                         | GA                        | 0.04               | H(WS) | A |
|                                            |                                                                                                                                                                                         | A, A-S, AA, AA-S, B, C, D | $2 \times 10^{-4}$ | H(FC) | A |
|                                            |                                                                                                                                                                                         | SA, SB, SC, I, SD         | $2 \times 10^{-4}$ | H(FC) | A |



|                                                   |                                                                                                                                                                                            |  |                           |                    |       |      |
|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------|--------------------|-------|------|
| Heptachlor epoxide<br>(1024-57-3)                 |                                                                                                                                                                                            |  | A, A-S, AA, AA-S          | 0.03               | H(WS) | A    |
|                                                   |                                                                                                                                                                                            |  | GA                        | 0.03               | H(WS) | A    |
|                                                   |                                                                                                                                                                                            |  | A, A-S, AA, AA-S, B, C, D | $3 \times 10^{-4}$ | H(FC) | A    |
|                                                   |                                                                                                                                                                                            |  | SA, SB, SC, I, SD         | $3 \times 10^{-4}$ | H(FC) | A    |
| Hexachloro-<br>benzene<br>(118-74-1)              |                                                                                                                                                                                            |  | A, A-S, AA, AA-S          | 0.04               | H(WS) | A    |
|                                                   |                                                                                                                                                                                            |  | GA                        | 0.04               | H(WS) | A    |
|                                                   |                                                                                                                                                                                            |  | A, A-S, AA, AA-S, B, C, D | $3 \times 10^{-5}$ | H(FC) | A    |
|                                                   |                                                                                                                                                                                            |  | SA, SB, SC, I, SD         | $3 \times 10^{-5}$ | H(FC) | A    |
| Hexachloro-<br>butadiene<br>(87-68-3)             |                                                                                                                                                                                            |  | A, A-S, AA, AA-S          | 0.5                | H(WS) | B    |
|                                                   |                                                                                                                                                                                            |  | GA                        | 0.5                | H(WS) | B    |
|                                                   |                                                                                                                                                                                            |  | A, A-S, AA, AA-S, B, C, D | 0.01               | H(FC) | B    |
|                                                   |                                                                                                                                                                                            |  | SA, SB, SC, I, SD         | 0.01               | H(FC) | B    |
|                                                   |                                                                                                                                                                                            |  | A, A-S, AA, AA-S, B, C    | 1.0 *              | A(C)  |      |
|                                                   |                                                                                                                                                                                            |  | D                         | 10 *               | A(A)  |      |
|                                                   |                                                                                                                                                                                            |  | SA, SB, SC                | 0.3                | A(C)  |      |
|                                                   |                                                                                                                                                                                            |  | SD                        | 3.0                | A(A)  |      |
| Remark:                                           | * For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) and (d) of this Title.  |  |                           |                    |       |      |
| alpha-Hexachloro-<br>cyclohexane<br>(319-84-6)    |                                                                                                                                                                                            |  | A, A-S, AA, AA-S          | 0.01               | H(WS) | A    |
|                                                   |                                                                                                                                                                                            |  | GA                        | 0.01               | H(WS) | A    |
|                                                   |                                                                                                                                                                                            |  | A, A-S, AA, AA-S, B, C, D | 0.002              | H(FC) | A    |
|                                                   |                                                                                                                                                                                            |  | SA, SB, SC, I, SD         | 0.002              | H(FC) | A    |
| beta-Hexachloro-<br>cyclohexane<br>(319-85-7)     |                                                                                                                                                                                            |  | A, A-S, AA, AA-S          | 0.04               | H(WS) | A    |
|                                                   |                                                                                                                                                                                            |  | GA                        | 0.04               | H(WS) | A    |
|                                                   |                                                                                                                                                                                            |  | A, A-S, AA, AA-S, B, C, D | 0.007              | H(FC) | A    |
|                                                   |                                                                                                                                                                                            |  | SA, SB, SC, I, SD         | 0.007              | H(FC) | A    |
| delta-Hexachloro-<br>cyclohexane<br>(319-86-8)    |                                                                                                                                                                                            |  | A, A-S, AA, AA-S          | 0.04               | H(WS) | A    |
|                                                   |                                                                                                                                                                                            |  | GA                        | 0.04               | H(WS) | A    |
|                                                   |                                                                                                                                                                                            |  | A, A-S, AA, AA-S, B, C, D | 0.008              | H(FC) | A    |
|                                                   |                                                                                                                                                                                            |  | SA, SB, SC, I, SD         | 0.008              | H(FC) | A    |
| epsilon-Hexachloro-<br>cyclohexane<br>(6108-10-7) |                                                                                                                                                                                            |  | A, A-S, AA, AA-S          | 0.04               | H(WS) | A    |
|                                                   |                                                                                                                                                                                            |  | GA                        | 0.04               | H(WS) | A    |
|                                                   |                                                                                                                                                                                            |  | A, A-S, AA, AA-S, B, C, D | 0.008              | H(FC) | A    |
|                                                   |                                                                                                                                                                                            |  | SA, SB, SC, I, SD         | 0.008              | H(FC) | A    |
| gamma-Hexachloro-<br>cyclohexane<br>(58-89-9)     |                                                                                                                                                                                            |  | A, A-S, AA, AA-S          | 0.05               | H(WS) | A    |
|                                                   |                                                                                                                                                                                            |  | GA                        | 0.05               | H(WS) | A    |
|                                                   |                                                                                                                                                                                            |  | A, A-S, AA, AA-S, B, C, D | 0.008              | H(FC) | A    |
|                                                   |                                                                                                                                                                                            |  | SA, SB, SC, I, SD         | 0.008              | H(FC) | A    |
| Hexachloro-<br>cyclopentadiene<br>(77-47-4)       |                                                                                                                                                                                            |  | A, A-S, AA, AA-S, B, C, D | 0.95               | A(A)  |      |
|                                                   |                                                                                                                                                                                            |  | GA                        | *                  | H(WS) | J    |
|                                                   |                                                                                                                                                                                            |  | A, A-S, AA, AA-S, B, C    | 0.45 **            | A(C)  |      |
|                                                   |                                                                                                                                                                                            |  | D                         | 4.5 **             | A(A)  |      |
|                                                   |                                                                                                                                                                                            |  | SA, SB, SC                | 0.07               | A(C)  |      |
|                                                   |                                                                                                                                                                                            |  | SD                        | 0.7                | A(A)  |      |
|                                                   |                                                                                                                                                                                            |  | A, A-S, AA, AA-S          | 1.0                | E(WS) | U    |
| Remarks:                                          | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                      |  |                           |                    |       |      |
|                                                   | ** For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) and (d) of this Title. |  |                           |                    |       |      |
| Hexachloroethane<br>(67-72-1)                     |                                                                                                                                                                                            |  | A, A-S, AA, AA-S          | 5                  | H(WS) | A, I |
|                                                   |                                                                                                                                                                                            |  | GA                        | *                  | H(WS) | J    |
|                                                   |                                                                                                                                                                                            |  | A, A-S, AA, AA-S, B, C, D | 0.6                | H(FC) | A    |
|                                                   |                                                                                                                                                                                            |  | SA, SB, SC, I, SD         | 0.6                | H(FC) | A    |
| Remark:                                           | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                      |  |                           |                    |       |      |
| Hexachlorophene<br>(70-30-4)                      |                                                                                                                                                                                            |  | GA                        | *                  | H(WS) | J    |
|                                                   |                                                                                                                                                                                            |  | A, A-S, AA, AA-S          | **                 | E(WS) |      |
|                                                   |                                                                                                                                                                                            |  | GA                        | **                 | E(WS) |      |
|                                                   |                                                                                                                                                                                            |  | A, A-S, AA, AA-S, B, C, D | ***                | E(FS) |      |
| Remarks:                                          | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                      |  |                           |                    |       |      |

|                                                |     |                                                                                                                                                                                         |        |       |   |  |
|------------------------------------------------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------|---|--|
|                                                | **  | Refer to standards for "Phenolic compounds (total phenols)."                                                                                                                            |        |       |   |  |
|                                                | *** | Refer to standards for "Phenols, total chlorinated."                                                                                                                                    |        |       |   |  |
| Hexachloropropene<br>(1888-71-7)               |     | GA                                                                                                                                                                                      | *      | H(WS) | J |  |
| Remark:                                        | *   | The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                     |        |       |   |  |
| Hexazinone<br>(51235-04-2)                     |     | GA                                                                                                                                                                                      | 50     | H(WS) | J |  |
| Hydrazine<br>(302-01-2)                        |     | A, A-S, AA, AA-S, B, C                                                                                                                                                                  | *      | A(C)  |   |  |
|                                                |     | D                                                                                                                                                                                       | **     | A(A)  |   |  |
| Remarks:                                       | *   | 5 ug/L at less than 50 ppm hardness and 10 ug/L at greater than or equal to 50 ppm hardness.                                                                                            |        |       |   |  |
|                                                | **  | 50 ug/L at less than 50 ppm hardness and 100 ug/L at greater than or equal to 50 ppm hardness.                                                                                          |        |       |   |  |
|                                                |     | For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) and (d) of this Title. |        |       |   |  |
| Hydrogen sulfide<br>(7783-06-4)                |     | A, A-S, AA, AA-S, B, C                                                                                                                                                                  | 2.0 *  | A(C)  |   |  |
|                                                |     | SA, SB, SC                                                                                                                                                                              | 2.0    | A(C)  |   |  |
| Remark:                                        | *   | For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) of this Title.         |        |       |   |  |
|                                                |     | Aquatic Type standards apply to undissociated form.                                                                                                                                     |        |       |   |  |
| Hydroquinone<br>(123-31-9)                     |     | A, A-S, AA, AA-S, B, C                                                                                                                                                                  | 2.2 ** | A(C)  |   |  |
|                                                |     | D                                                                                                                                                                                       | 4.4 ** | A(A)  |   |  |
|                                                |     | A, A-S, AA, AA-S                                                                                                                                                                        | *      | E(WS) |   |  |
|                                                |     | GA                                                                                                                                                                                      | *      | E(WS) |   |  |
|                                                |     | A, A-S, AA, AA-S, B, C, D                                                                                                                                                               | ***    | E(FS) |   |  |
| Remarks:                                       | *   | Refer to standards for "Phenolic compounds (total phenols)."                                                                                                                            |        |       |   |  |
|                                                | **  | For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) and (d) of this Title. |        |       |   |  |
|                                                | *** | Refer to standards for "Phenols, total unchlorinated."                                                                                                                                  |        |       |   |  |
| Iron<br>(CAS No. Not Applicable)               |     | A, A-S, AA, AA-S                                                                                                                                                                        | 300    | E(WS) | G |  |
|                                                |     | GA                                                                                                                                                                                      | 300 *  | E(WS) | F |  |
| Remark:                                        | *   | Also see standard for "Iron and Manganese."                                                                                                                                             |        |       |   |  |
| Iron and Manganese<br>(CAS No. Not Applicable) |     | GA                                                                                                                                                                                      | 500 *  | E(WS) | F |  |
| Remark:                                        | *   | Applies to the sum of these substances; also see individual standards for "Iron" and "Manganese."                                                                                       |        |       |   |  |
| Isodecyl diphenyl<br>phosphate<br>(29761-21-5) |     | A, A-S, AA, AA-S, B, C                                                                                                                                                                  | 1.7 *  | A(C)  |   |  |
|                                                |     | D                                                                                                                                                                                       | 22 *   | A(A)  |   |  |
| Remark:                                        | *   | For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) and (d) of this Title. |        |       |   |  |
| Isodrin<br>(465-73-6)                          |     | GA                                                                                                                                                                                      | *      | H(WS) | J |  |
| Remark:                                        | *   | The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                     |        |       |   |  |
| Isopropalin<br>(33820-53-0)                    |     | GA                                                                                                                                                                                      | *      | H(WS) | J |  |
| Remark:                                        | *   | The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                     |        |       |   |  |
| Isopropylbenzene<br>(98-82-8)                  |     | GA                                                                                                                                                                                      | *      | H(WS) | J |  |

|                                                                                                                              |                                                                                                                                                                                           |        |       |   |  |
|------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------|---|--|
| Remark:                                                                                                                      | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                     |        |       |   |  |
| 2-Isopropyltoluene<br>(527-84-4)                                                                                             | A, A-S, AA, AA-S                                                                                                                                                                          | 5      | H(WS) | I |  |
|                                                                                                                              | GA                                                                                                                                                                                        | *      | H(WS) | J |  |
| Remark:                                                                                                                      | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                     |        |       |   |  |
| 3-Isopropyltoluene<br>(535-77-3)                                                                                             | A, A-S, AA, AA-S                                                                                                                                                                          | 5      | H(WS) | I |  |
|                                                                                                                              | GA                                                                                                                                                                                        | *      | H(WS) | J |  |
| Remark:                                                                                                                      | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                     |        |       |   |  |
| 4-Isopropyltoluene<br>(99-87-6)                                                                                              | A, A-S, AA, AA-S                                                                                                                                                                          | 5      | H(WS) | I |  |
|                                                                                                                              | GA                                                                                                                                                                                        | *      | H(WS) | J |  |
| Remark:                                                                                                                      | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                     |        |       |   |  |
| Isothiazolones, total<br>(isothiazolinones)                                                                                  | A, A-S, AA, AA-S, B, C                                                                                                                                                                    | 1 *    | A(C)  |   |  |
| (includes 5-chloro-<br>2-methyl-4-<br>isothiazolin-3-one<br>& 2-methyl-4-<br>isothiazolin-3-one)<br>(CAS No. Not Applicable) | D                                                                                                                                                                                         | 10 *   | A(A)  |   |  |
| Remark:                                                                                                                      | * For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) and (d) of this Title. |        |       |   |  |
|                                                                                                                              | Standards apply to the sum of these substances.                                                                                                                                           |        |       |   |  |
| Kepone<br>(143-50-0)                                                                                                         | GA                                                                                                                                                                                        | ND     | H(WS) | F |  |
| Lead<br>(CAS No. Not Applicable)                                                                                             | A, A-S, AA, AA-S                                                                                                                                                                          | 50     | H(WS) | G |  |
|                                                                                                                              | GA                                                                                                                                                                                        | 25     | H(WS) | F |  |
|                                                                                                                              | A, A-S, AA, AA-S, B, C                                                                                                                                                                    | *      | A(C)  |   |  |
|                                                                                                                              | A, A-S, AA, AA-S, B, C, D                                                                                                                                                                 | **     | A(A)  |   |  |
|                                                                                                                              | SA, SB, SC, I                                                                                                                                                                             | 8      | A(C)  |   |  |
|                                                                                                                              | SA, SB, SC, I, SD                                                                                                                                                                         | 204    | A(A)  |   |  |
| Remarks:                                                                                                                     | * {1.46203 - [ln (hardness) (0.145712)] } exp (1.273 [ln (hardness)] - 4.297)                                                                                                             |        |       |   |  |
|                                                                                                                              | ** {1.46203 - [ln (hardness) (0.145712)] } exp (1.273 [ln (hardness)] - 1.052)                                                                                                            |        |       |   |  |
|                                                                                                                              | Aquatic Type standards apply to dissolved form.                                                                                                                                           |        |       |   |  |
| Linear alkyl<br>benzene sul-<br>fonates (LAS)<br>(CAS No. Not Applicable)                                                    | A, A-S, AA, AA-S, B, C                                                                                                                                                                    | 40 *   | A(C)  |   |  |
| Remarks:                                                                                                                     | * LAS with side chains greater than 13 carbons only; applies to the sum of these substances.                                                                                              |        |       |   |  |
|                                                                                                                              | * For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) of this Title.         |        |       |   |  |
| Magnesium<br>(CAS No. Not Applicable)                                                                                        | A, A-S, AA, AA-S                                                                                                                                                                          | 35,000 | H(WS) | B |  |
| Malathion<br>(121-75-5)                                                                                                      | GA                                                                                                                                                                                        | 7.0    | H(WS) | F |  |
|                                                                                                                              | A, A-S, AA, AA-S, B, C                                                                                                                                                                    | 0.1 *  | A(C)  |   |  |
|                                                                                                                              | SA, SB, SC                                                                                                                                                                                | 0.1    | A(C)  |   |  |
| Remark:                                                                                                                      | * For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) of this Title.         |        |       |   |  |
| Mancozeb<br>(8018-01-7)                                                                                                      | GA                                                                                                                                                                                        | 1.8    | H(WS) | F |  |
| Maneb<br>(12427-38-2)                                                                                                        | GA                                                                                                                                                                                        | 1.8    | H(WS) | F |  |
| Manganese<br>(CAS No. Not Applicable)                                                                                        | A, A-S, AA, AA-S                                                                                                                                                                          | 300    | E(WS) | G |  |
|                                                                                                                              | GA                                                                                                                                                                                        | 300 *  | E(WS) | F |  |
| Remark:                                                                                                                      | * Also see standards for "Iron and Manganese."                                                                                                                                            |        |       |   |  |
| Mercury                                                                                                                      | A, A-S, AA, AA-S                                                                                                                                                                          | 0.7    | H(WS) | B |  |

|                                                                 |                                                                                                                                                                                   |                      |       |   |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------|---|
| (CAS No.<br>Not Applicable)                                     | GA                                                                                                                                                                                | 0.7                  | H(WS) | B |
|                                                                 | A, A-S, AA, AA-S, B, C, D                                                                                                                                                         | $7 \times 10^{-4}$ * | H(FC) | B |
|                                                                 | SA, SB, SC, I, SD                                                                                                                                                                 | $7 \times 10^{-4}$ * | H(FC) | B |
|                                                                 | A, A-S, AA, AA-S, B, C                                                                                                                                                            | 0.77 *               | A(C)  |   |
|                                                                 | A, A-S, AA, AA-S, B, C, D                                                                                                                                                         | 1.4 *                | A(A)  |   |
|                                                                 | A, A-S, AA, AA-S, B, C, D                                                                                                                                                         | 0.0026 *             | W     |   |
|                                                                 | SA, SB, SC, I, SD                                                                                                                                                                 | 0.0026 *             | W     |   |
| Remark:                                                         | * Applies to dissolved form.                                                                                                                                                      |                      |       |   |
| Methacrylonitrile<br>(126-98-7)                                 | GA                                                                                                                                                                                | *                    | H(WS) | J |
| Remark:                                                         | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |                      |       |   |
| Methomyl<br>(16752-77-5)                                        | GA                                                                                                                                                                                | *                    | H(WS) |   |
| Remark:                                                         | * Refer to standard for "Aldicarb and Methomyl."                                                                                                                                  |                      |       |   |
| Methoxychlor<br>(72-43-5)                                       | A, A-S, AA, AA-S                                                                                                                                                                  | 35                   | H(WS) | H |
|                                                                 | GA                                                                                                                                                                                | 35                   | H(WS) | F |
|                                                                 | A, A-S, AA, AA-S, B, C                                                                                                                                                            | 0.03 *               | A(C)  |   |
|                                                                 | SA, SB, SC                                                                                                                                                                        | 0.03                 | A(C)  |   |
| Remark:                                                         | * For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) of this Title. |                      |       |   |
| N-Methylaniline<br>(100-61-8)                                   | A, A-S, AA, AA-S                                                                                                                                                                  | 5                    | H(WS) | I |
|                                                                 | GA                                                                                                                                                                                | *                    | H(WS) | J |
| Remark:                                                         | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |                      |       |   |
| Methyl chloride<br>(74-87-3)                                    | A, A-S, AA, AA-S                                                                                                                                                                  | 5                    | H(WS) | I |
|                                                                 | GA                                                                                                                                                                                | *                    | H(WS) | J |
| Remark:                                                         | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |                      |       |   |
| 2-Methyl-4-chloro-<br>phenoxyacetic acid<br>(94-74-6)           | GA                                                                                                                                                                                | 0.44                 | H(WS) | F |
| 4,4'-Methylene-bis-<br>(2-chloroaniline)<br>(101-14-4)          | GA                                                                                                                                                                                | *                    | H(WS) | J |
| Remark:                                                         | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |                      |       |   |
| 4,4'-Methylene-bis-<br>(N-methyl)aniline<br>(1807-55-2)         | GA                                                                                                                                                                                | *                    | H(WS) | J |
| Remark:                                                         | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |                      |       |   |
| 4,4'-Methylene-bis-<br>(N,N'-dimethyl)<br>aniline<br>(101-61-1) | GA                                                                                                                                                                                | *                    | H(WS) | J |
| Remark:                                                         | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |                      |       |   |
| Methylene<br>bisthiocyanate<br>(6317-18-6)                      | A, A-S, AA, AA-S, B, C                                                                                                                                                            | 1.0 *                | A(C)  |   |
| Remark:                                                         | * For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) of this Title. |                      |       |   |
| Methylene chloride<br>(75-09-2)                                 | A, A-S, AA, AA-S                                                                                                                                                                  | 5                    | H(WS) | I |
|                                                                 | GA                                                                                                                                                                                | *                    | H(WS) | J |
|                                                                 | A, A-S, AA, AA-S, B, C, D                                                                                                                                                         | 200                  | H(FC) | A |
|                                                                 | SA, SB, SC, I, SD                                                                                                                                                                 | 200                  | H(FC) | A |
| Remark:                                                         | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |                      |       |   |
| Methyl iodide                                                   | GA                                                                                                                                                                                | *                    | H(WS) | J |

|                                                   |  |                                                                                                                                                                                           |                    |       |   |
|---------------------------------------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------|---|
| (74-88-4)                                         |  |                                                                                                                                                                                           |                    |       |   |
| Remark:                                           |  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                     |                    |       |   |
| Methyl methacrylate (80-62-6)                     |  | GA                                                                                                                                                                                        | 50                 | H(WS) | J |
| Methyl parathion (298-00-0)                       |  | GA                                                                                                                                                                                        | *                  | H(WS) |   |
|                                                   |  | A, A-S, AA, AA-S, B, C                                                                                                                                                                    | *                  | A(C)  |   |
| Remark:                                           |  | * Refer to the standards for "Parathion and Methyl parathion."                                                                                                                            |                    |       |   |
| alpha-Methylstyrene (98-83-9)                     |  | A, A-S, AA, AA-S                                                                                                                                                                          | 5                  | H(WS) | I |
|                                                   |  | GA                                                                                                                                                                                        | *                  | H(WS) | J |
| Remark:                                           |  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                     |                    |       |   |
| 2-Methylstyrene (611-15-4)                        |  | A, A-S, AA, AA-S                                                                                                                                                                          | 5                  | H(WS) | I |
|                                                   |  | GA                                                                                                                                                                                        | *                  | H(WS) | J |
| Remark:                                           |  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                     |                    |       |   |
| 3-Methylstyrene (100-80-1)                        |  | A, A-S, AA, AA-S                                                                                                                                                                          | 5                  | H(WS) | I |
|                                                   |  | GA                                                                                                                                                                                        | *                  | H(WS) | J |
| Remark:                                           |  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                     |                    |       |   |
| 4-Methylstyrene (622-97-9)                        |  | A, A-S, AA, AA-S                                                                                                                                                                          | 5                  | H(WS) | I |
|                                                   |  | GA                                                                                                                                                                                        | *                  | H(WS) | J |
| Remark:                                           |  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                     |                    |       |   |
| Metolachlor (51218-45-2)                          |  | A, A-S, AA, AA-S                                                                                                                                                                          | 10                 | H(WS) | A |
|                                                   |  | GA                                                                                                                                                                                        | 10                 | H(WS) | A |
| Metribuzin (21087-64-9)                           |  | GA                                                                                                                                                                                        | 50                 | H(WS) | J |
| Mirex (2385-85-5)                                 |  | A, A-S, AA, AA-S                                                                                                                                                                          | 0.03               | H(WS) | A |
|                                                   |  | GA                                                                                                                                                                                        | 0.03               | H(WS) | A |
|                                                   |  | A, A-S, AA, AA-S, B, C, D                                                                                                                                                                 | $1 \times 10^{-6}$ | H(FC) | A |
|                                                   |  | SA, SB, SC, I, SD                                                                                                                                                                         | $1 \times 10^{-6}$ | H(FC) | A |
|                                                   |  | A, A-S, AA, AA-S, B, C                                                                                                                                                                    | 0.001 *            | A(C)  |   |
|                                                   |  | D                                                                                                                                                                                         | 0.001 *            | A(A)  |   |
|                                                   |  | SA, SB, SC                                                                                                                                                                                | 0.001              | A(C)  |   |
| Remark:                                           |  | * For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) and (d) of this Title. |                    |       |   |
| Nabam (142-59-6)                                  |  | GA                                                                                                                                                                                        | 1.8                | H(WS) | F |
| Naphthalene (91-20-3)                             |  | A, A-S, AA, AA-S                                                                                                                                                                          | 10                 | E(WS) | U |
| Niacinamide (98-92-0)                             |  | A, A-S, AA, AA-S                                                                                                                                                                          | 500                | H(WS) | B |
| Nickel (CAS No. Not Applicable)                   |  | A, A-S, AA, AA-S                                                                                                                                                                          | 100                | H(WS) | B |
|                                                   |  | GA                                                                                                                                                                                        | 100                | H(WS) | B |
|                                                   |  | A, A-S, AA, AA-S, B, C                                                                                                                                                                    | *                  | A(C)  |   |
|                                                   |  | A, A-S, AA, AA-S, B, C, D                                                                                                                                                                 | **                 | A(A)  |   |
|                                                   |  | SA, SB, SC, I                                                                                                                                                                             | 8.2                | A(C)  |   |
|                                                   |  | SA, SB, SC, I, SD                                                                                                                                                                         | 74                 | A(A)  |   |
| Remarks:                                          |  | * (0.997) exp (0.846 [ln (hardness)] + 0.0584)                                                                                                                                            |                    |       |   |
|                                                   |  | ** (0.998) exp (0.846 [ln (hardness)] + 2.255)                                                                                                                                            |                    |       |   |
|                                                   |  | Aquatic Type standards apply to dissolved form.                                                                                                                                           |                    |       |   |
| Nitralin (4726-14-1)                              |  | GA                                                                                                                                                                                        | 35                 | H(WS) | F |
| Nitrate (expressed as N) (CAS No. Not Applicable) |  | A, A-S, AA, AA-S                                                                                                                                                                          | 10,000 *           | H(WS) | G |
|                                                   |  | GA                                                                                                                                                                                        | 10,000 *           | H(WS) | G |
| Remark:                                           |  | * Also see standards for "Nitrate and Nitrite."                                                                                                                                           |                    |       |   |
| Nitrate and Nitrite                               |  | A, A-S, AA, AA-S                                                                                                                                                                          | 10,000 *           | H(WS) | G |

|                          |    |                                                                                                                                                                                 |                    |       |   |
|--------------------------|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------|---|
| (expressed as N)         |    | GA                                                                                                                                                                              | 10,000 *           | H(WS) | G |
| (CAS No. Not Applicable) |    |                                                                                                                                                                                 |                    |       |   |
| Remark:                  | *  | Applies to the sum of these substances; also see individual standards for "Nitrate" and "Nitrite."                                                                              |                    |       |   |
| Nitritoltri-             |    | A, A-S, AA, AA-S                                                                                                                                                                | 3 *                | H(WS) | A |
| acetic acid              |    | GA                                                                                                                                                                              | 3 *                | H(WS) | A |
| (CAS No. Not Applicable) |    | A, A-S, AA, AA-S, B, C                                                                                                                                                          | 5,000 **           | A(C)  |   |
| Remarks:                 | *  | Includes related forms that convert to nitritotriacetic acid upon acidification to a pH of 2.3 or less.                                                                         |                    |       |   |
|                          | ** | Applies to nitritotriacetate.                                                                                                                                                   |                    |       |   |
|                          | ** | For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) of this Title. |                    |       |   |
| Nitrite (expressed as N) |    | A, A-S, AA, AA-S                                                                                                                                                                | 1,000 *            | H(WS) | G |
| (CAS No.                 |    | GA                                                                                                                                                                              | 1,000 *            | H(WS) | G |
| Not Applicable)          |    | A, A-S, AA, AA-S, B, C                                                                                                                                                          | **                 | A(C)  |   |
| Remarks:                 | *  | Also see standards for "Nitrate and Nitrite."                                                                                                                                   |                    |       |   |
|                          | ** | Standard is 100 ug/L except 20 ug/L for trout waters (T or TS).                                                                                                                 |                    |       |   |
|                          | ** | For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) of this Title. |                    |       |   |
| 2-Nitroaniline           |    | GA                                                                                                                                                                              | *                  | H(WS) | J |
| (88-74-4)                |    |                                                                                                                                                                                 |                    |       |   |
| Remark:                  | *  | The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |                    |       |   |
| 3-Nitroaniline           |    | GA                                                                                                                                                                              | *                  | H(WS) | J |
| (99-09-2)                |    |                                                                                                                                                                                 |                    |       |   |
| Remark:                  | *  | The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |                    |       |   |
| 4-Nitroaniline           |    | GA                                                                                                                                                                              | *                  | H(WS) | J |
| (100-01-6)               |    |                                                                                                                                                                                 |                    |       |   |
| Remark:                  | *  | The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |                    |       |   |
| Nitrobenzene             |    | A, A-S, AA, AA-S                                                                                                                                                                | 0.4                | H(WS) | A |
| (98-95-3)                |    | GA                                                                                                                                                                              | 0.4                | H(WS) | A |
|                          |    | A, A-S, AA, AA-S                                                                                                                                                                | 30                 | E(WS) | U |
| 2-Nitrotoluene           |    | GA                                                                                                                                                                              | *                  | H(WS) | J |
| (88-72-2)                |    |                                                                                                                                                                                 |                    |       |   |
| Remark:                  | *  | The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |                    |       |   |
| 3-Nitrotoluene           |    | GA                                                                                                                                                                              | *                  | H(WS) | J |
| (99-08-1)                |    |                                                                                                                                                                                 |                    |       |   |
| Remark:                  | *  | The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |                    |       |   |
| 4-Nitrotoluene           |    | GA                                                                                                                                                                              | *                  | H(WS) | J |
| (99-99-0)                |    |                                                                                                                                                                                 |                    |       |   |
| Remark:                  | *  | The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |                    |       |   |
| 5-Nitro-o-toluidine      |    | GA                                                                                                                                                                              | *                  | H(WS) | J |
| (99-55-8)                |    |                                                                                                                                                                                 |                    |       |   |
| Remark:                  | *  | The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |                    |       |   |
| Octachlorostyrene        |    | A, A-S, AA, AA-S                                                                                                                                                                | 0.2                | H(WS) | B |
| (29082-74-4)             |    | GA                                                                                                                                                                              | 0.2                | H(WS) | B |
|                          |    | A, A-S, AA, AA-S, B, C, D                                                                                                                                                       | $6 \times 10^{-6}$ | H(FC) | B |
|                          |    | SA, SB, SC, I, SD                                                                                                                                                               | $6 \times 10^{-6}$ | H(FC) | B |
| Oxamyl                   |    | GA                                                                                                                                                                              | 50                 | H(WS) | J |
| (23135-22-0)             |    |                                                                                                                                                                                 |                    |       |   |
| Paraquat                 |    | GA                                                                                                                                                                              | 3.0                | H(WS) | F |
| (4685-14-7)              |    |                                                                                                                                                                                 |                    |       |   |
| Parathion                |    | GA                                                                                                                                                                              | *                  | H(WS) |   |
| (56-38-2)                |    | A, A-S, AA, AA-S, B, C                                                                                                                                                          | *                  | A(C)  |   |
|                          |    | A, A-S, AA, AA-S, B, C, D                                                                                                                                                       | 0.065              | A(A)  |   |

|                                |      |                                                                                                                                                                                                                         |          |       |   |
|--------------------------------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------|---|
| Remark:                        | *    | Refer to standards for "Parathion and Methyl parathion."                                                                                                                                                                |          |       |   |
| Parathion and Methyl parathion |      | GA                                                                                                                                                                                                                      | 1.5 *    | H(WS) | F |
| (56-38-2; 298-00-0)            |      | A, A-S, AA, AA-S, B, C                                                                                                                                                                                                  | 0.008 ** | A(C)  |   |
| Remarks:                       | *    | Applies to the sum of these substances.                                                                                                                                                                                 |          |       |   |
|                                | **   | Applies to the sum of these substances. For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) of this Title. |          |       |   |
| Pendimethalin                  |      | GA                                                                                                                                                                                                                      | *        | H(WS) | J |
| (40487-42-1)                   |      |                                                                                                                                                                                                                         |          |       |   |
| Remark:                        | *    | The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                                                     |          |       |   |
| Pentachloro-benzene            |      | GA                                                                                                                                                                                                                      | *        | H(WS) | J |
| (608-93-5)                     |      |                                                                                                                                                                                                                         |          |       |   |
| Remark:                        | *    | The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                                                     |          |       |   |
| Pentachloroethane              |      | GA                                                                                                                                                                                                                      | *        | H(WS) | J |
| (76-01-7)                      |      |                                                                                                                                                                                                                         |          |       |   |
| Remark:                        | *    | The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                                                     |          |       |   |
| Pentachloro-nitrobenzene       |      | GA                                                                                                                                                                                                                      | ND       | H(WS) | F |
| (82-68-8)                      |      |                                                                                                                                                                                                                         |          |       |   |
| Pentachloro-phenol             |      | A, A-S, AA, AA-S, B, C                                                                                                                                                                                                  | *        | A(C)  |   |
| (87-86-5)                      |      | A, A-S, AA, AA-S, B, C, D                                                                                                                                                                                               | **       | A(A)  |   |
|                                |      | A, A-S, AA, AA-S                                                                                                                                                                                                        | ***      | E(WS) |   |
|                                |      | GA                                                                                                                                                                                                                      | ***      | E(WS) |   |
|                                |      | A, A-S, AA, AA-S, B, C, D                                                                                                                                                                                               | ****     | E(FS) |   |
| Remarks:                       | *    | exp [1.005 (pH) - 5.134]                                                                                                                                                                                                |          |       |   |
|                                | **   | exp [1.005 (pH) - 4.869]                                                                                                                                                                                                |          |       |   |
|                                | ***  | Refer to standards for "Phenolic compounds (total phenols)."                                                                                                                                                            |          |       |   |
|                                | **** | Refer to standards for "Phenols, total chlorinated."                                                                                                                                                                    |          |       |   |
| Phenol                         |      | A, A-S, AA, AA-S                                                                                                                                                                                                        | *        | E(WS) |   |
| (108-95-2)                     |      | GA                                                                                                                                                                                                                      | *        | E(WS) |   |
|                                |      | A, A-S, AA, AA-S, B, C, D                                                                                                                                                                                               | **       | E(FS) |   |
| Remarks:                       | *    | Refer to standards for "Phenolic compounds (total phenols)."                                                                                                                                                            |          |       |   |
|                                | **   | Refer to standards for "Phenols, total unchlorinated."                                                                                                                                                                  |          |       |   |
| Phenolic compounds             |      | A, A-S, AA, AA-S                                                                                                                                                                                                        | 1 *      | E(WS) | U |
| (total phenols)                |      | GA                                                                                                                                                                                                                      | 1 *      | E(WS) | U |
| (CAS No. Not Applicable)       |      |                                                                                                                                                                                                                         |          |       |   |
| Remark:                        | *    | Applies to the sum of these substances.                                                                                                                                                                                 |          |       |   |
| Phenols, total                 |      | A, A-S, AA, AA-S                                                                                                                                                                                                        | *        | E(WS) |   |
| chlorinated                    |      | GA                                                                                                                                                                                                                      | *        | E(WS) |   |
| (CAS No. Not Applicable)       |      | A, A-S, AA, AA-S, B, C, D                                                                                                                                                                                               | 1.0 **   | E(FS) | V |
| Remarks:                       | *    | Refer to standards for "Phenolic compounds (total phenols)."                                                                                                                                                            |          |       |   |
|                                | **   | Applies to the sum of these substances.                                                                                                                                                                                 |          |       |   |
| Phenols, total                 |      | A, A-S, AA, AA-S                                                                                                                                                                                                        | *        | E(WS) |   |
| unchlorinated                  |      | GA                                                                                                                                                                                                                      | *        | E(WS) |   |
| (CAS No. Not Applicable)       |      | A, A-S, AA, AA-S, B, C, D                                                                                                                                                                                               | 5.0 **   | E(FS) | V |
| Remarks:                       | *    | Refer to standards for "Phenolic compounds (total phenols)."                                                                                                                                                            |          |       |   |
|                                | **   | Applies to the sum of these substances.                                                                                                                                                                                 |          |       |   |
| 1,2-Phenylenediamine           |      | GA                                                                                                                                                                                                                      | *        | H(WS) | J |
| (95-54-5)                      |      |                                                                                                                                                                                                                         |          |       |   |
| Remark:                        | *    | The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                                                     |          |       |   |



|                                                              |                                                                                                                                                                                                                                                                                                                                                              |                        |       |   |
|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-------|---|
| 1,3-Phenylenediamine<br>(108-45-2)                           | GA                                                                                                                                                                                                                                                                                                                                                           | *                      | H(WS) | J |
| Remark:                                                      | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                                                                                                                                                                                        |                        |       |   |
| 1,4-Phenylenediamine<br>(106-50-3)                           | GA                                                                                                                                                                                                                                                                                                                                                           | *                      | H(WS) | J |
| Remark:                                                      | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                                                                                                                                                                                        |                        |       |   |
| Phenyl ether<br>(101-84-8)                                   | A, A-S, AA, AA-S                                                                                                                                                                                                                                                                                                                                             | 10                     | E(WS) | U |
| Phenylhydrazine<br>(100-63-0)                                | GA                                                                                                                                                                                                                                                                                                                                                           | *                      | H(WS) | J |
| Remark:                                                      | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                                                                                                                                                                                        |                        |       |   |
| 3-Phenyl-1-propene<br>(637-50-3)                             | A, A-S, AA, AA-S                                                                                                                                                                                                                                                                                                                                             | 5                      | H(WS) | I |
|                                                              | GA                                                                                                                                                                                                                                                                                                                                                           | *                      | H(WS) | J |
| Remark:                                                      | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                                                                                                                                                                                        |                        |       |   |
| cis-1-Phenyl-1-propene<br>(766-90-5)                         | A, A-S, AA, AA-S                                                                                                                                                                                                                                                                                                                                             | 5                      | H(WS) | I |
|                                                              | GA                                                                                                                                                                                                                                                                                                                                                           | *                      | H(WS) | J |
| Remark:                                                      | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                                                                                                                                                                                        |                        |       |   |
| trans-1-Phenyl-1-propene<br>(873-66-5)                       | A, A-S, AA, AA-S                                                                                                                                                                                                                                                                                                                                             | 5                      | H(WS) | I |
|                                                              | GA                                                                                                                                                                                                                                                                                                                                                           | *                      | H(WS) | J |
| Remark:                                                      | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                                                                                                                                                                                        |                        |       |   |
| Phorate<br>(298-02-2)                                        | GA                                                                                                                                                                                                                                                                                                                                                           | *                      | H(WS) |   |
| Remark:                                                      | * Refer to standards for "Phorate and Disulfoton."                                                                                                                                                                                                                                                                                                           |                        |       |   |
| Phorate and<br>Disulfoton<br>(298-02-2;<br>298-04-4)         | GA                                                                                                                                                                                                                                                                                                                                                           | ND *                   | H(WS) | F |
| Remark:                                                      | * Applies to the sum of these substances.                                                                                                                                                                                                                                                                                                                    |                        |       |   |
| Picloram<br>(CAS No. Not Applicable)                         | GA                                                                                                                                                                                                                                                                                                                                                           | 50 *                   | H(WS) | J |
| Remark:                                                      | * Includes: related forms that convert to the organic acid upon acidification to a pH of 2 or less; and esters of the organic acid.                                                                                                                                                                                                                          |                        |       |   |
| Polybrominated<br>biphenyls<br>(CAS No. Not Applicable)      | GA                                                                                                                                                                                                                                                                                                                                                           | *                      | H(WS) | J |
| Remark:                                                      | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to each congener individually.                                                                                                                                                                                                            |                        |       |   |
| Polychlorinated<br>biphenyls<br>(CAS No. Not Applicable)     | A, A-S, AA, AA-S                                                                                                                                                                                                                                                                                                                                             | 0.09 *                 | H(WS) | A |
|                                                              | GA                                                                                                                                                                                                                                                                                                                                                           | 0.09 *                 | H(WS) | A |
|                                                              | A, A-S, AA, AA-S, B, C, D                                                                                                                                                                                                                                                                                                                                    | $1 \times 10^{-6}$ *   | H(FC) | A |
|                                                              | SA, SB, SC, I, SD                                                                                                                                                                                                                                                                                                                                            | $1 \times 10^{-6}$ *   | H(FC) | A |
|                                                              | A, A-S, AA, AA-S, B, C, D                                                                                                                                                                                                                                                                                                                                    | $1.2 \times 10^{-4}$ * | W     |   |
|                                                              | SA, SB, SC, I, SD                                                                                                                                                                                                                                                                                                                                            | $1.2 \times 10^{-4}$ * | W     |   |
| Remark:                                                      | * Applies to the sum of these substances.                                                                                                                                                                                                                                                                                                                    |                        |       |   |
| Principal organic<br>contaminant<br>(CAS No. Not Applicable) | GA                                                                                                                                                                                                                                                                                                                                                           | 5                      | H(WS) | J |
| Remarks:                                                     | This standard applies to any and every individual substance, whether listed in this Table or not, that is in one of the principal organic contaminant classes as defined in section 700.1 of this Title <i>except</i> any substance that has a H(WS) Type standard for class GA waters (other than 5 ug/L with Basic Code J) listed elsewhere in this Table. |                        |       |   |
|                                                              | For the convenience of the reader, the principal organic contaminant standard                                                                                                                                                                                                                                                                                |                        |       |   |

|                                                                                                                                                                              |                                                                                                                                                                                   |       |       |   |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------|---|--|
|                                                                                                                                                                              | of 5 ug/L (Basic Code J), is listed in this Table for some but not all substances regulated by this standard.                                                                     |       |       |   |  |
|                                                                                                                                                                              | A less stringent guidance value for an individual substance may be substituted for this standard if so determined by the Commissioner of the New York State Department of Health. |       |       |   |  |
| Prometon<br>(1610-18-0)                                                                                                                                                      | GA                                                                                                                                                                                | 50    | H(WS) | J |  |
| Propachlor<br>(1918-16-7)                                                                                                                                                    | GA                                                                                                                                                                                | 35    | H(WS) | F |  |
| Propanil<br>(709-98-8)                                                                                                                                                       | GA                                                                                                                                                                                | 7.0   | H(WS) | F |  |
| Propazine<br>(139-40-2)                                                                                                                                                      | GA                                                                                                                                                                                | 16    | H(WS) | F |  |
| Propham<br>(122-42-9)                                                                                                                                                        | GA                                                                                                                                                                                | 50    | H(WS) | J |  |
| n-Propylbenzene<br>(103-65-1)                                                                                                                                                | A, A-S, AA, AA-S                                                                                                                                                                  | 5     | H(WS) | I |  |
|                                                                                                                                                                              | GA                                                                                                                                                                                | *     | H(WS) | J |  |
| Remark:                                                                                                                                                                      | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |       |       |   |  |
| Quaternary ammo-<br>nium compounds<br>(including<br>dimethyl benzyl<br>ammonium chlo-<br>ride and dimethyl<br>ethyl benzyl<br>ammonium chloride)<br>(CAS No. Not Applicable) | A, A-S, AA, AA-S, B, C                                                                                                                                                            | 10 *  | A(C)  |   |  |
| Remarks:                                                                                                                                                                     | * Applies to the sum of these substances.                                                                                                                                         |       |       |   |  |
|                                                                                                                                                                              | * For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) of this Title. |       |       |   |  |
| Radium 226<br>(CAS No. Not Applicable)                                                                                                                                       | A, AA                                                                                                                                                                             | *     | H(WS) | H |  |
|                                                                                                                                                                              | GA                                                                                                                                                                                | *     | H(WS) | H |  |
| Remark:                                                                                                                                                                      | * 3 picocuries per liter; also see standards for "Radium 226 and Radium 228."                                                                                                     |       |       |   |  |
| Radium 226 and<br>Radium 228<br>(CAS No. Not Applicable)                                                                                                                     | A, A-S, AA, AA-S                                                                                                                                                                  | *     | H(WS) | G |  |
|                                                                                                                                                                              | GA                                                                                                                                                                                | *     | H(WS) | G |  |
| Remark:                                                                                                                                                                      | * 5 picocuries per liter; Applies to the sum of these substances.                                                                                                                 |       |       |   |  |
| Radium 228<br>(CAS No. Not Applicable)                                                                                                                                       | A, A-S, AA, AA-S                                                                                                                                                                  | *     | H(WS) |   |  |
|                                                                                                                                                                              | GA                                                                                                                                                                                | *     | H(WS) |   |  |
| Remark:                                                                                                                                                                      | * Refer to standards for "Radium 226 and Radium 228."                                                                                                                             |       |       |   |  |
| Selenium<br>(CAS No.<br>Not Applicable)                                                                                                                                      | A, A-S, AA, AA-S                                                                                                                                                                  | 10    | H(WS) | G |  |
|                                                                                                                                                                              | GA                                                                                                                                                                                | 10    | H(WS) | G |  |
|                                                                                                                                                                              | A, A-S, AA, AA-S, B, C                                                                                                                                                            | 4.6 * | A(C)  |   |  |
| Remark:                                                                                                                                                                      | * Aquatic Type standard applies to dissolved form.                                                                                                                                |       |       |   |  |
| Silver<br>(CAS No.<br>Not Applicable)                                                                                                                                        | A, A-S, AA, AA-S                                                                                                                                                                  | 50    | H(WS) | G |  |
|                                                                                                                                                                              | GA                                                                                                                                                                                | 50    | H(WS) | F |  |
|                                                                                                                                                                              | A, A-S, AA, AA-S, B, C                                                                                                                                                            | 0.1 * | A(C)  |   |  |
|                                                                                                                                                                              | D                                                                                                                                                                                 | **    | A(A)  |   |  |
|                                                                                                                                                                              | SD                                                                                                                                                                                | 2.3   | A(A)  |   |  |

|                                                                          |                                                                                                                                                                                                      |         |       |   |  |
|--------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-------|---|--|
| Remarks:                                                                 | * Applies to ionic silver.                                                                                                                                                                           |         |       |   |  |
|                                                                          | ** exp(1.72 [ln (ppm hardness)] - 6.52)                                                                                                                                                              |         |       |   |  |
|                                                                          | Standards for D and SD Classes apply to acid-soluble form.                                                                                                                                           |         |       |   |  |
|                                                                          | For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) and (d) of this Title.              |         |       |   |  |
| Simazine<br>(122-34-9)                                                   | A, A-S, AA, AA-S                                                                                                                                                                                     | 0.5     | H(WS) | A |  |
| Sodium<br>(CAS No. Not Applicable)                                       | GA                                                                                                                                                                                                   | 0.5     | H(WS) | A |  |
| Strontium 90<br>(CAS No. Not Applicable)                                 | GA                                                                                                                                                                                                   | 20,000  | H(WS) | H |  |
|                                                                          | A, A-S, AA, AA-S                                                                                                                                                                                     | *       | H(WS) | G |  |
| Remarks:                                                                 | * 8 picocuries per liter.                                                                                                                                                                            |         |       |   |  |
|                                                                          | If two or more radionuclides are present, the sum of their doses shall not exceed an annual potential dose of 4 millirems per year.                                                                  |         |       |   |  |
| Styrene<br>(100-42-5)                                                    | GA                                                                                                                                                                                                   | *       | H(WS) | J |  |
|                                                                          | A, A-S, AA, AA-S                                                                                                                                                                                     | 50      | E(WS) | U |  |
| Remark:                                                                  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                                |         |       |   |  |
| Sulfate<br>(CAS No. Not Applicable)                                      | A, A-S, AA, AA-S                                                                                                                                                                                     | 250,000 | H(WS) | G |  |
| Sulfite<br>(CAS No. Not Applicable)                                      | GA                                                                                                                                                                                                   | 250,000 | H(WS) | F |  |
|                                                                          | A, A-S, AA, AA-S, B, C                                                                                                                                                                               | 200 *   | A(C)  |   |  |
| Remark:                                                                  | * For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) of this Title.                    |         |       |   |  |
| Tebuthiuron<br>(34014-18-1)                                              | GA                                                                                                                                                                                                   | 50      | H(WS) | J |  |
| Terbacil<br>(5902-51-2)                                                  | GA                                                                                                                                                                                                   | 50      | H(WS) | J |  |
| Tetrachloro-<br>benzenes<br>(634-66-2; 634-90-2;<br>95-94-3; 12408-10-5) | GA                                                                                                                                                                                                   | *       | H(WS) | J |  |
|                                                                          | A, A-S, AA, AA-S                                                                                                                                                                                     | 10 **   | E(WS) | U |  |
| Remarks:                                                                 | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to each isomer (1,2,3,4-, 1,2,3,5-, and 1,2,4,5-tetrachlorobenzene) individually. |         |       |   |  |
|                                                                          | ** Applies to the sum of 1,2,3,4-, 1,2,3,5-, and 1,2,4,5-tetrachlorobenzene.                                                                                                                         |         |       |   |  |
| 1,1,1,2-Tetrachloroethane<br>(630-20-6)                                  | A, A-S, AA, AA-S                                                                                                                                                                                     | 5       | H(WS) | I |  |
|                                                                          | GA                                                                                                                                                                                                   | *       | H(WS) | J |  |
| Remark:                                                                  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                                |         |       |   |  |
| 1,1,2,2-Tetrachloroethane<br>(79-34-5)                                   | GA                                                                                                                                                                                                   | *       | H(WS) | J |  |
| Remark:                                                                  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                                |         |       |   |  |
| Tetrachloroethene<br>(127-18-4)                                          | GA                                                                                                                                                                                                   | *       | H(WS) | J |  |
| Remark:                                                                  | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                                |         |       |   |  |
| Tetrachloroterephthalic acid                                             | GA                                                                                                                                                                                                   | 50      | H(WS) | J |  |

|                                     |                                                                                                                                                                                   |                    |       |   |  |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------|---|--|
| (2136-79-0)                         |                                                                                                                                                                                   |                    |       |   |  |
| alpha, alpha, alpha, 4-Tetrachloro- | GA                                                                                                                                                                                | *                  | H(WS) | J |  |
| toluene                             |                                                                                                                                                                                   |                    |       |   |  |
| (5216-25-1)                         |                                                                                                                                                                                   |                    |       |   |  |
| Remark:                             | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |                    |       |   |  |
| Thallium                            | A, A-S, AA, AA-S, B, C                                                                                                                                                            | 8 *                | A(C)  |   |  |
| (CAS No. Not Applicable)            | D                                                                                                                                                                                 | 20                 | A(A)  |   |  |
| Remark:                             | * For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) of this Title. |                    |       |   |  |
|                                     | Aquatic Type standards apply to acid-soluble form.                                                                                                                                |                    |       |   |  |
| Theophylline                        | A, A-S, AA, AA-S                                                                                                                                                                  | 40                 | H(WS) | B |  |
| (58-55-9)                           |                                                                                                                                                                                   |                    |       |   |  |
| Thiram                              | GA                                                                                                                                                                                | 1.8                | H(WS) | F |  |
| (137-26-8)                          |                                                                                                                                                                                   |                    |       |   |  |
| Toluene                             | A, A-S, AA, AA-S                                                                                                                                                                  | 5                  | H(WS) | I |  |
| (108-88-3)                          | GA                                                                                                                                                                                | *                  | H(WS) | J |  |
|                                     | A, A-S, AA, AA-S, B, C, D                                                                                                                                                         | 6,000              | H(FC) | B |  |
|                                     | SA, SB, SC, I, SD                                                                                                                                                                 | 6,000              | H(FC) | B |  |
| Remark:                             | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |                    |       |   |  |
| Toluene-2,4-diamine                 | GA                                                                                                                                                                                | *                  | H(WS) | J |  |
| (95-80-7)                           |                                                                                                                                                                                   |                    |       |   |  |
| Remark:                             | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |                    |       |   |  |
| Toluene-2,5-diamine                 | GA                                                                                                                                                                                | *                  | H(WS) | J |  |
| (95-70-5)                           |                                                                                                                                                                                   |                    |       |   |  |
| Remark:                             | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |                    |       |   |  |
| Toluene-2,6-diamine                 | GA                                                                                                                                                                                | *                  | H(WS) | J |  |
| (823-40-5)                          |                                                                                                                                                                                   |                    |       |   |  |
| Remark:                             | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |                    |       |   |  |
| o-Toluidine                         | GA                                                                                                                                                                                | *                  | H(WS) | J |  |
| (95-53-4)                           |                                                                                                                                                                                   |                    |       |   |  |
| Remark:                             | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |                    |       |   |  |
| Toxaphene                           | A, A-S, AA, AA-S                                                                                                                                                                  | 0.06               | H(WS) | A |  |
| (8001-35-2)                         | GA                                                                                                                                                                                | 0.06               | H(WS) | A |  |
|                                     | A, A-S, AA, AA-S, B, C, D                                                                                                                                                         | $6 \times 10^{-6}$ | H(FC) | A |  |
|                                     | SA, SB, SC, I, SD                                                                                                                                                                 | $6 \times 10^{-6}$ | H(FC) | A |  |
|                                     | A, A-S, AA, AA-S, B, C                                                                                                                                                            | 0.005              | A(C)  |   |  |
|                                     | D                                                                                                                                                                                 | 1.6 *              | A(A)  |   |  |
|                                     | SA, SB, SC                                                                                                                                                                        | 0.005              | A(C)  |   |  |
| Remark:                             | * For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic standard if so determined under section 702.15(d) of this Title.      |                    |       |   |  |
| 1,2,4-Tribromobenzene               | A, A-S, AA, AA-S                                                                                                                                                                  | 5                  | H(WS) | I |  |
| (615-54-3)                          | GA                                                                                                                                                                                | *                  | H(WS) | J |  |
| Remark:                             | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |                    |       |   |  |
| 2,4,6-Trichloroaniline              | GA                                                                                                                                                                                | *                  | H(WS) | J |  |
| (634-93-5)                          |                                                                                                                                                                                   |                    |       |   |  |
| Remark:                             | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                             |                    |       |   |  |
| Trichloro-                          | GA                                                                                                                                                                                | *                  | H(WS) | J |  |
| benzenes                            | A, A-S, AA, AA-S, B, C                                                                                                                                                            | 5 **               | A(C)  |   |  |
| (87-61-6; 120-82-1;                 | SA, SB, SC                                                                                                                                                                        | 5 **               | A(C)  |   |  |
| 108-70-3;                           | A, A-S, AA, AA-S                                                                                                                                                                  | 10 **              | E(WS) | U |  |
| 12002-48-1)                         | D                                                                                                                                                                                 | 50 **              | E(FS) | V |  |

|                                                        |                                                                                                                                                                                             |    |              |                |        |
|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------|----------------|--------|
|                                                        |                                                                                                                                                                                             | SD | 50 **        | E(FS)          | V      |
| Remarks:                                               | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to each isomer (1,2,3-, 1,2,4- and 1,3,5-trichlorobenzene) individually. |    |              |                |        |
|                                                        | ** Applies to the sum of 1,2,3-, 1,2,4- and 1,3,5-trichlorobenzene.                                                                                                                         |    |              |                |        |
|                                                        | For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) of this Title.             |    |              |                |        |
| 1,1,1-Trichloroethane<br>(71-55-6)                     | A, A-S, AA, AA-S<br>GA                                                                                                                                                                      |    | 5<br>*       | H(WS)<br>H(WS) | I<br>J |
| Remark:                                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                       |    |              |                |        |
| 1,1,2-Trichloroethane<br>(79-00-5)                     | A, A-S, AA, AA-S<br>GA                                                                                                                                                                      |    | 1<br>1       | H(WS)<br>H(WS) | A<br>A |
| Trichloroethene<br>(79-01-6)                           | A, A-S, AA, AA-S<br>GA                                                                                                                                                                      |    | 5<br>*       | H(WS)<br>H(WS) | I<br>J |
|                                                        | A, A-S, AA, AA-S, B, C, D                                                                                                                                                                   |    | 40           | H(FC)          | A      |
|                                                        | SA, SB, SC, I, SD                                                                                                                                                                           |    | 40           | H(FC)          | A      |
| Remark:                                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                       |    |              |                |        |
| Trichlorofluoromethane<br>(75-69-4)                    | A, A-S, AA, AA-S<br>GA                                                                                                                                                                      |    | 5<br>*       | H(WS)<br>H(WS) | I<br>J |
| Remark:                                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                       |    |              |                |        |
| 2,4,5-Trichlorophe-<br>noxyacetic acid<br>(93-76-5)    | GA                                                                                                                                                                                          |    | 35           | H(WS)          | F      |
| 2,4,5-Trichlorophe-<br>noxypropionic acid<br>(93-72-1) | A, A-S, AA, AA-S<br>GA                                                                                                                                                                      |    | 10<br>0.26   | H(WS)<br>H(WS) | G<br>F |
| 1,1,2-Trichloropropane<br>(598-77-6)                   | A, A-S, AA, AA-S<br>GA                                                                                                                                                                      |    | 5<br>*       | H(WS)<br>H(WS) | I<br>J |
| Remark:                                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                       |    |              |                |        |
| 1,2,3-Trichloropropane<br>(96-18-4)                    | A, A-S, AA, AA-S<br>GA                                                                                                                                                                      |    | 0.04<br>0.04 | H(WS)<br>H(WS) | A<br>A |
| cis-1,2,3-Trichloropropene<br>(13116-57-9)             | A, A-S, AA, AA-S<br>GA                                                                                                                                                                      |    | 5<br>*       | H(WS)<br>H(WS) | I<br>J |
| Remark:                                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                       |    |              |                |        |
| trans-1,2,3-Trichloro-<br>propene<br>(13116-58-0)      | A, A-S, AA, AA-S<br>GA                                                                                                                                                                      |    | 5<br>*       | H(WS)<br>H(WS) | I<br>J |
| Remark:                                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                       |    |              |                |        |
| alpha,2,4-Trichlorotoluene<br>(94-99-5)                | A, A-S, AA, AA-S<br>GA                                                                                                                                                                      |    | 5<br>*       | H(WS)<br>H(WS) | I<br>J |
| Remark:                                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                       |    |              |                |        |
| alpha,2,6-Trichlorotoluene<br>(2014-83-7)              | A, A-S, AA, AA-S<br>GA                                                                                                                                                                      |    | 5<br>*       | H(WS)<br>H(WS) | I<br>J |
| Remark:                                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                       |    |              |                |        |
| alpha,3,4-Trichlorotoluene<br>(102-47-6)               | A, A-S, AA, AA-S<br>GA                                                                                                                                                                      |    | 5<br>*       | H(WS)<br>H(WS) | I<br>J |
| Remark:                                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                       |    |              |                |        |
| alpha,alpha,2-Trichloro-                               | A, A-S, AA, AA-S                                                                                                                                                                            |    | 5            | H(WS)          | I      |

|                                                         |                                                                                                                                       |        |                |        |
|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|--------|----------------|--------|
| toluene<br>(88-66-4)                                    | GA                                                                                                                                    | *      | H(WS)          | J      |
| Remark:                                                 | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |        |                |        |
| alpha,alpha,4-Trichloro-<br>toluene<br>(13940-94-8)     | A, A-S, AA, AA-S<br>GA                                                                                                                | 5<br>* | H(WS)<br>H(WS) | I<br>J |
| Remark:                                                 | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |        |                |        |
| 2,3,4-Trichlorotoluene<br>(7359-72-0)                   | GA                                                                                                                                    | *      | H(WS)          | J      |
| Remark:                                                 | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |        |                |        |
| 2,3,5-Trichlorotoluene<br>(56961-86-5)                  | GA                                                                                                                                    | *      | H(WS)          | J      |
| Remark:                                                 | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |        |                |        |
| 2,3,6-Trichlorotoluene<br>(2077-46-5)                   | GA                                                                                                                                    | *      | H(WS)          | J      |
| Remark:                                                 | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |        |                |        |
| 2,4,5-Trichlorotoluene<br>(6639-30-1)                   | GA                                                                                                                                    | *      | H(WS)          | J      |
| Remark:                                                 | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |        |                |        |
| 2,4,6-Trichlorotoluene<br>(23749-65-7)                  | GA                                                                                                                                    | *      | H(WS)          | J      |
| Remark:                                                 | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |        |                |        |
| 1,1,1-Trichloro-2,2,2-<br>trifluoroethane<br>(354-58-5) | A, A-S, AA, AA-S<br>GA                                                                                                                | 5<br>* | H(WS)<br>H(WS) | I<br>J |
| Remark:                                                 | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |        |                |        |
| 1,1,2-Trichloro-1,2,2-<br>trifluoroethane<br>(76-13-1)  | A, A-S, AA, AA-S<br>GA                                                                                                                | 5<br>* | H(WS)<br>H(WS) | I<br>J |
| Remark:                                                 | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |        |                |        |
| Trifluralin<br>(1582-09-8)                              | GA                                                                                                                                    | 35     | H(WS)          | F      |
| 1,2,3-Trimethyl-<br>benzene<br>(526-73-8)               | A, A-S, AA, AA-S<br>GA                                                                                                                | 5<br>* | H(WS)<br>H(WS) | I<br>J |
| Remark:                                                 | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |        |                |        |
| 1,2,4-Trimethyl-<br>benzene<br>(95-63-6)                | A, A-S, AA, AA-S<br>GA                                                                                                                | 5<br>* | H(WS)<br>H(WS) | I<br>J |
| Remark:                                                 | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |        |                |        |
| 1,3,5-Trimethyl-<br>benzene<br>(108-67-8)               | A, A-S, AA, AA-S<br>GA                                                                                                                | 5<br>* | H(WS)<br>H(WS) | I<br>J |
| Remark:                                                 | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |        |                |        |
| sym-Trinitrobenzene<br>(99-35-4)                        | GA                                                                                                                                    | *      | H(WS)          | J      |
| Remark:                                                 | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. |        |                |        |
| 2,3,4-Trinitrotoluene<br>(602-29-9)                     | GA                                                                                                                                    | *      | H(WS)          | J      |

|                                        |                                                                                                                                                                                           |       |       |   |  |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------|---|--|
| Remark:                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                     |       |       |   |  |
| 2,3,6-Trinitrotoluene<br>(18292-97-2)  | GA                                                                                                                                                                                        | *     | H(WS) | J |  |
| Remark:                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                     |       |       |   |  |
| 2,4,5-Trinitrotoluene<br>(610-25-3)    | GA                                                                                                                                                                                        | *     | H(WS) | J |  |
| Remark:                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                     |       |       |   |  |
| 2,4,6-Trinitrotoluene<br>(118-96-7)    | GA                                                                                                                                                                                        | *     | H(WS) | J |  |
| Remark:                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                     |       |       |   |  |
| 3,4,5-Trinitrotoluene<br>(603-15-6)    | GA                                                                                                                                                                                        | *     | H(WS) | J |  |
| Remark:                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                     |       |       |   |  |
| Triphenyl<br>phosphate<br>(115-86-6)   | A, A-S, AA, AA-S, B, C                                                                                                                                                                    | 4 *   | A(C)  |   |  |
|                                        | D                                                                                                                                                                                         | 40 *  | A(A)  |   |  |
| Remark:                                | * For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) and (d) of this Title. |       |       |   |  |
| Tritium<br>(CAS No. Not Applicable)    | A, A-S, AA, AA-S                                                                                                                                                                          | *     | H(WS) | G |  |
| Remark:                                | * 20,000 picocuries per liter; if two or more radionuclides are present, the sum of their annual dose equivalent to the total body or any organ shall not exceed 4 millirems per year.    |       |       |   |  |
| Uranyl ion<br>(CAS No. Not Applicable) | GA                                                                                                                                                                                        | 5,000 | H(WS) | H |  |
| Vanadium<br>(CAS No. Not Applicable)   | A, A-S, AA, AA-S, B, C                                                                                                                                                                    | 14 *  | A(C)  |   |  |
|                                        | D                                                                                                                                                                                         | 190 * | A(A)  |   |  |
| Remark:                                | * For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) and (d) of this Title. |       |       |   |  |
|                                        | Aquatic Type standards apply to acid-soluble form.                                                                                                                                        |       |       |   |  |
| Vinyl chloride<br>(75-01-4)            | GA                                                                                                                                                                                        | 2     | H(WS) | G |  |
| 1,2-Xylene<br>(95-47-6)                | A, A-S, AA, AA-S                                                                                                                                                                          | 5     | H(WS) | I |  |
|                                        | GA                                                                                                                                                                                        | *     | H(WS) | J |  |
| Remark:                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                     |       |       |   |  |
| 1,3-Xylene<br>(108-38-3)               | A, A-S, AA, AA-S                                                                                                                                                                          | 5     | H(WS) | I |  |
|                                        | GA                                                                                                                                                                                        | *     | H(WS) | J |  |
| Remark:                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                     |       |       |   |  |
| 1,4-Xylene<br>(106-42-3)               | A, A-S, AA, AA-S                                                                                                                                                                          | 5     | H(WS) | I |  |
|                                        | GA                                                                                                                                                                                        | *     | H(WS) | J |  |
| Remark:                                | * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.                                                     |       |       |   |  |
| Zinc<br>(CAS No. Not Applicable)       | A, A-S, AA, AA-S, B, C                                                                                                                                                                    | *     | A(C)  |   |  |
|                                        | A, A-S, AA, AA-S, B, C, D                                                                                                                                                                 | **    | A(A)  |   |  |
|                                        | SA, SB, SC, I                                                                                                                                                                             | 66    | A(C)  |   |  |
|                                        | SD                                                                                                                                                                                        | 95    | A(A)  |   |  |
| Remarks:                               | Aquatic Type standards apply to dissolved form.                                                                                                                                           |       |       |   |  |
|                                        | * $\exp(0.85 [\ln(\text{ppm hardness})] + 0.50)$                                                                                                                                          |       |       |   |  |
|                                        | ** $0.978 \exp(0.8473 [\ln(\text{ppm hardness})] + 0.884)$                                                                                                                                |       |       |   |  |
| Zineb (12122-67-7)                     | GA                                                                                                                                                                                        | 1.8   | H(WS) | F |  |
| Ziram (137-30-4)                       | GA                                                                                                                                                                                        | 4.2   | H(WS) | F |  |

**Table 2**

## BASIS OF STANDARDS

(*cf. section 703.5*)

| BASIS<br>CODE | BASIS                                                                                 |
|---------------|---------------------------------------------------------------------------------------|
| A             | Oncogenic, Human Health                                                               |
| B             | Non-oncogenic, Human Health                                                           |
| F             | Former Groundwater Regulations, 6 NYCRR § 703.5(a)(3), Human Health or Aesthetics     |
| G             | Specific MCL, Human Health or Aesthetics                                              |
| H             | Former Use of or Reference to 10 NYCRR Part 170, Human Health or Aesthetics           |
| I             | Principal Organic Contaminant Classes, Human Health                                   |
| J             | Former Groundwater Reference to 10 NYCRR Subpart 5-1, General Standards, Human Health |
| U             | Potable Water, Aesthetics                                                             |
| V             | Food Source, Aesthetics                                                               |

6 CRR-NY 703.5

Current through September 30, 2021

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END OF DOCUMENT



## Appendix B

### Health and Safety Plan

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September 2025  
Nepera Harriman Site Remediation Program

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## Health and Safety Plan

Prepared for  
Nepera, Inc., and Warner-Lambert Company  
Corporate Defendants



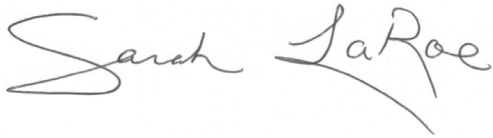
September 2025  
Nepera Harriman Site Remediation Program

# Health and Safety Plan

**Prepared for**  
Nepera, Inc., and Warner-Lambert Company,  
LLC (Corporate Defendants)

**Prepared by**  
Anchor QEA, LLC  
290 Elwood Davis Road, Suite 340  
Liverpool, New York 13088

## Certification Page



---

Sarah LaRoe, PhD  
Project Manager  
Anchor QEA, LLC

Date: September 4, 2025



---

Natalie Lynch  
Field Lead  
Anchor QEA, LLC

Date: September 4, 2025

The information in this Health and Safety Plan has been designed for the Scope of Work presently contemplated by Anchor QEA, LLC. Therefore, this document may not be appropriate if the work is not performed by or using the methods presently contemplated by Anchor QEA. In addition, as the work is performed, conditions different from those anticipated may be encountered and this document may have to be modified. Therefore, Anchor QEA only intends this plan to address currently anticipated activities and conditions and makes no representations or warranties as to the adequacy of the Health and Safety Plan for all conditions encountered.

# Health and Safety Plan Acknowledgement Form

Project Number: 253099-01.01

Project Name: Nepera Harriman Site Remediation Program

My signature below certifies that I have read and understand the policies and procedures specified in this Health and Safety Plan (HASP). For non-Anchor QEA employees, this HASP may include company-specific appendices to this plan developed by entities other than Anchor QEA.

Non-affiliated personnel may be required to sign the Liability Waiver following this Acknowledgement Form.

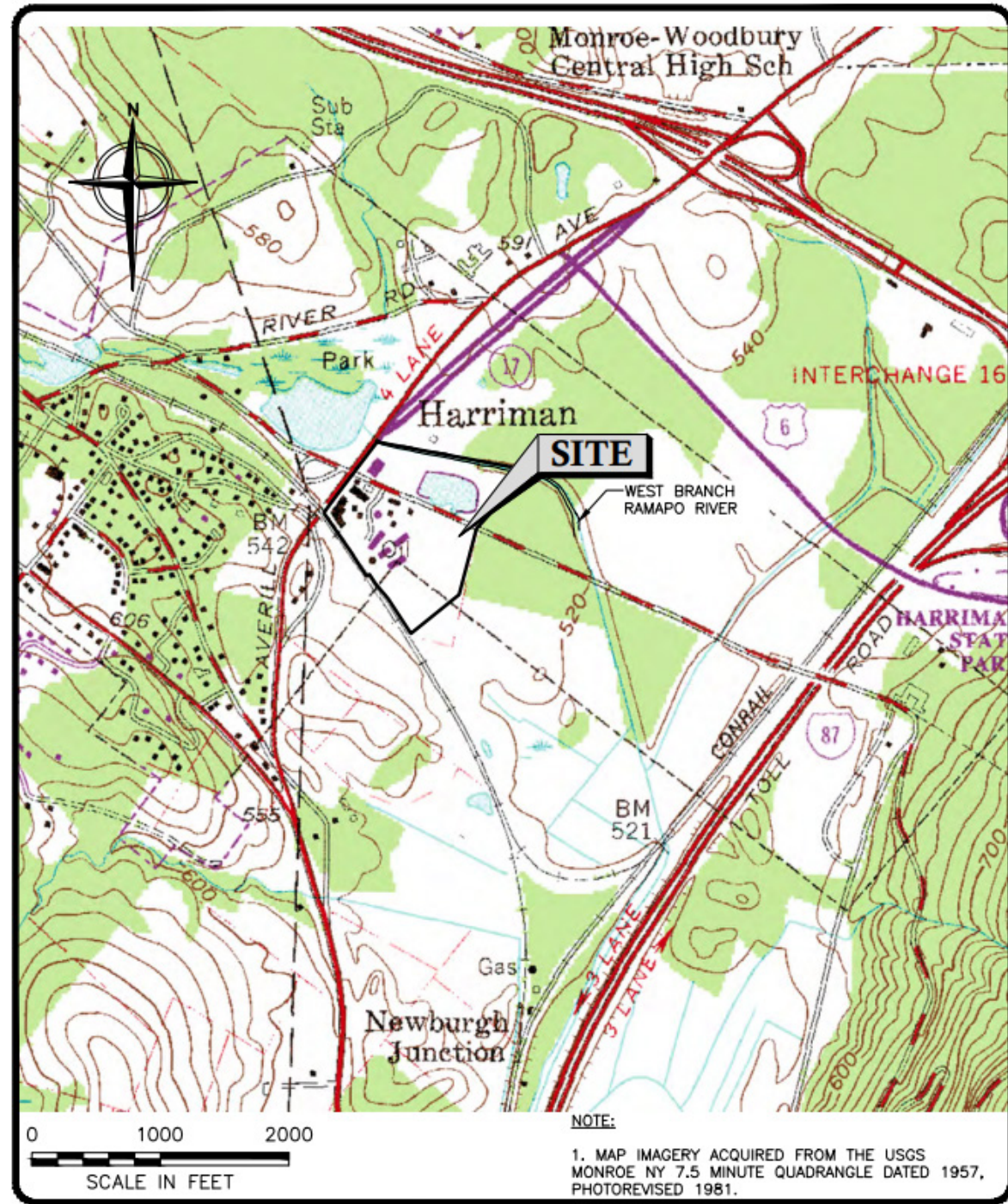
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## Site Emergency Procedures

**Figure A**  
**General Site Location Overview**



## Emergency Contact Information

**Table A**  
**Site Emergency Form and Emergency Phone Numbers\***

| Category                                           | Information                                                                                                                                                                                                |                                                |
|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| Possible Chemicals of Concern                      | PFAS, mercury, VOCs , pyridine, alpha-picoline, 2-aminopyridine, , PAHs, PCBs, TCE, vinyl chloride, acetone, manganese, sulfate, zinc, lead, nickel, arsenic, copper, cadmium, barium, nitrate and ammonia |                                                |
| Minimum Level of Protection                        | Modified Level D                                                                                                                                                                                           |                                                |
| Site(s) Location Address                           | Corner of Route 17 and Arden House Road, Harriman New York, 10926                                                                                                                                          |                                                |
| Emergency Phone Numbers                            |                                                                                                                                                                                                            |                                                |
| Ambulance                                          | 911                                                                                                                                                                                                        |                                                |
| Fire                                               | 911                                                                                                                                                                                                        |                                                |
| Police                                             | 911                                                                                                                                                                                                        |                                                |
| Poison Control                                     | (800) 222-1222                                                                                                                                                                                             |                                                |
| Client Contact                                     | Seth Levine                                                                                                                                                                                                | Office: (201) 804-3038<br>Cell: (973) 432-5126 |
|                                                    | Eric Gaulin                                                                                                                                                                                                | Office: (908) 901-7463<br>Cell: (908) 380-6880 |
| Project Manager (PM)                               | Sarah LaRoe                                                                                                                                                                                                | Office: (518) 886-0647<br>Cell: (518) 330-4448 |
| Field Lead (FL)                                    | Natalie Lynch                                                                                                                                                                                              | Office: (201) 571-0917<br>Cell: (224) 420-6278 |
| Director of Health and Safety (DOHS)               | Tim Shaner                                                                                                                                                                                                 | Office: (251) 375-5282<br>Cell: (251) 281-3386 |
| State Emergency Response System                    | (518) 292-2200                                                                                                                                                                                             |                                                |
| EPA Emergency Response Team, <sup>1</sup> Region 2 | (732) 906-6850                                                                                                                                                                                             |                                                |

Notes:

\* In the event of any emergency, contact the PM and FL.

1. For local resources, please visit: <http://www2.epa.gov/emergency-response/emergency-response-my-community>. The National Response Center hotline is (800) 424-8802.

**Table B**  
**Hospital Information**

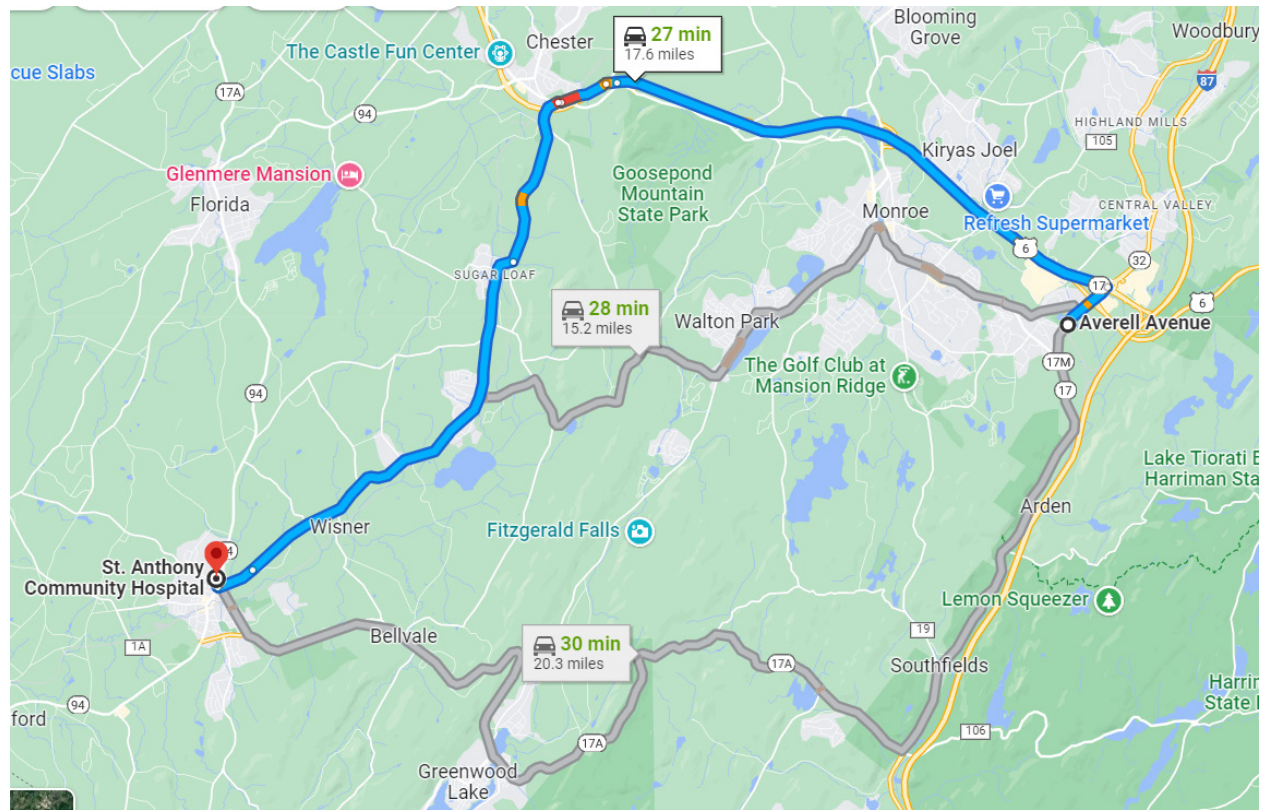
| Category        | Information                   |
|-----------------|-------------------------------|
| Hospital Name   | St Anthony Community Hospital |
| Address         | 15 Maple Avenue               |
| City, State     | Warwick, New York, 10990      |
| Phone           | (845) 986-2276                |
| Emergency Phone | 911                           |



## Hospital Route Map and Driving Directions

1. Head Northwest on Arden House Road toward NY-17 N
2. Turn right onto NY-17 N and merge left onto NY-17W
3. Take Exit 127 toward Greycourt Road/Sugar Loaf/Warwick
4. Turn Left onto Lehigh Avenue and merge onto NY-17M-W
5. Turn left onto Kings Highway
6. Turn Right onto Co Road 13/Kings Highway
7. Turn right onto Maple Avenue
8. Turn left onto Grand Street
9. Drive up to hospital Emergency Room entrance

**Figure B**  
**Hospital Route Map**



## Care Management—WorkCare Incident Intervention

Anchor QEA has an additional Incident Intervention resource from WorkCare to help answer questions, alleviate uncertainty and stress in a potential injury situation, and maintain the health and safety of our employees. Incident Intervention is an injury and illness management tool that provides

employees with 24 hours a day/7 days a week (24/7) immediate telephone access to a member of WorkCare’s clinical staff of nurses and physicians who intervene at the time of a workplace injury or illness. Contact information is provided below:

- Access WorkCare 24/7 from anywhere using the toll-free number: 1-888-449-7787

At the time of a workplace injury or illness, the employee, manager, or another employee at the scene notifies WorkCare using the toll-free number listed above. The caller provides information on the type of incident, possible cause, and the scope of the situation. With the details of the incident recorded, an experienced nurse or physician provides the following:

- Responsive evaluation of the incident
- Direction on the appropriate course of action
- Consultation with the employee’s treating physician to design a quality care treatment plan that meets the needs of the employee and Anchor QEA

All employees are encouraged to use this service should a workplace injury or illness occur.

## Key Safety Personnel

The following people share responsibility for health and safety at the site. See Section 4 of this Health and Safety Plan (HASP) for a description of the role and responsibility of each.

|                                                  |                                                |
|--------------------------------------------------|------------------------------------------------|
| Client Contact: Seth Levine                      | Office: (201) 804-3038<br>Cell: (973) 432-5126 |
| Client Contact: Eric Gaulin                      | Office: (908) 901-7463<br>Cell: (908) 380-6880 |
| Project Manager (PM): Sarah LaRoe                | Office: (518) 886-0647<br>Cell: (518) 330-4448 |
| Field Lead (FL): Natalie Lynch                   | Office: (201) 571-0917<br>Cell: (224) 420-6278 |
| Director of Health and Safety (DOHS): Tim Shaner | Office: (251) 375-5282<br>Cell: (251) 281-3386 |

## Personal Incident Response Procedures

In the event of an emergency, immediate action must be taken by the first person to recognize the event. Use the following steps as a guideline and refer to Figure C:

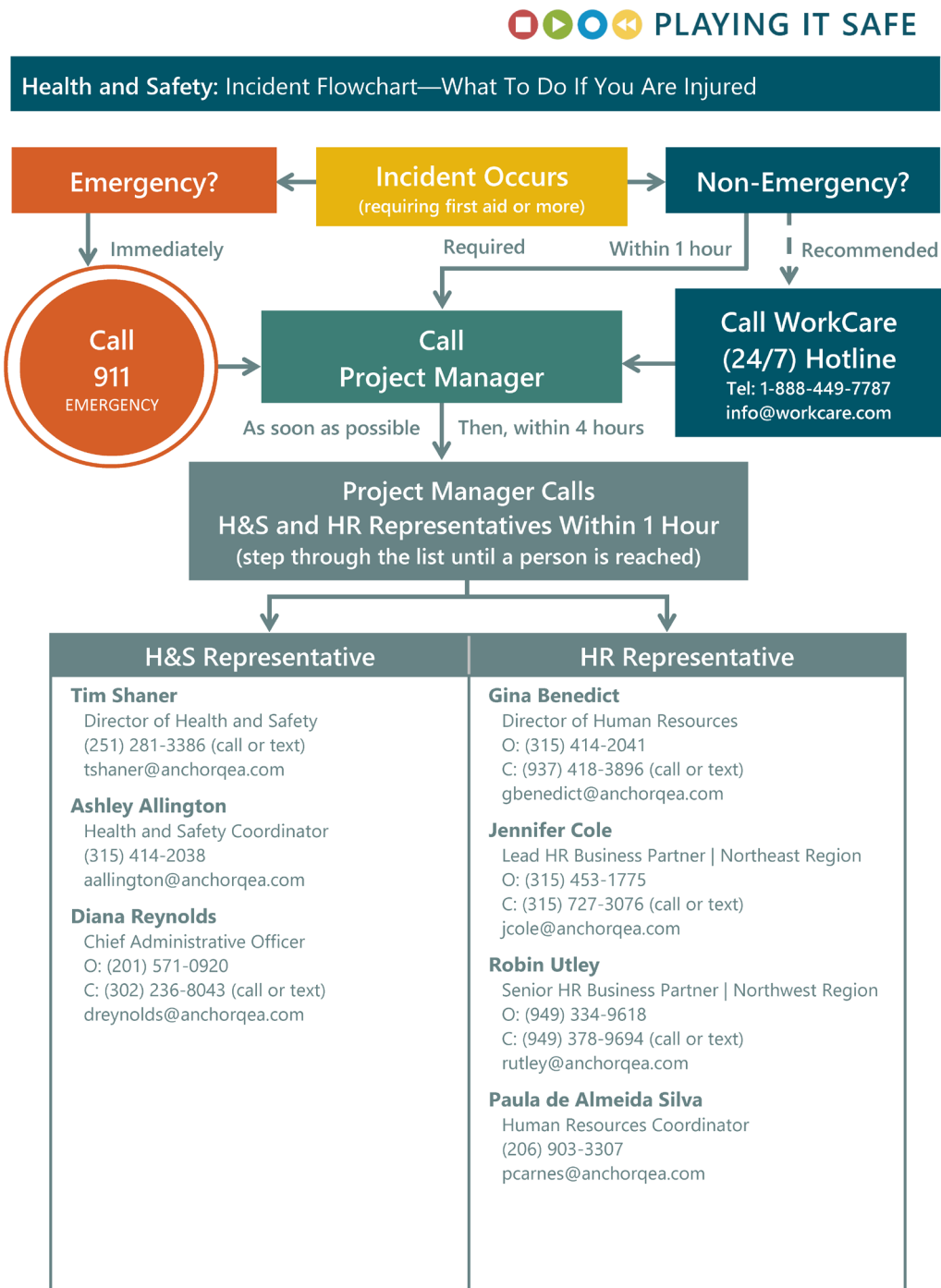
1. Survey the situation to verify that it is safe for you and the victim. Do not endanger your own life. Do not enter an area to rescue someone who has been overcome unless properly equipped and trained. Verify that all protocols are followed. If applicable, review Safety Data Sheets (SDS) to evaluate response actions for chemical exposures.

2. Call the appropriate emergency number (911, if available) or direct someone else to do this immediately (see Table A). Explain the physical injury, chemical exposure, fire, or release and location of the incident.
3. Have someone retrieve the nearest first aid kit (containing appropriate items for the particular work scope) and Automated External Defibrillator (AED), if available. Note: Only use an AED if you have been properly trained and are currently certified to do so.
4. Decontaminate the victim without delaying life-saving procedures (see Section 8).
5. Administer first aid and cardiopulmonary resuscitation (CPR), if properly trained, until emergency responders arrive.<sup>1</sup>
6. In the event that evacuation is required, the FL must perform a head count to verify that all Anchor QEA personnel are accounted for.
7. Notify the Field Lead (FL) and Project Manager (PM); the PM will notify the client contact. The PM will also contact the Director of Health and Safety (DOHS). The DOHS will facilitate the incident investigation. All client requirements pertinent to personal incident reporting will also be adhered to.
8. Complete the appropriate incident investigation reports.

---

<sup>1</sup> Personnel qualified and currently certified in basic first aid or CPR are protected under Good Samaritan policies as long as they only perform the basic tasks that they were taught. Do not perform first aid or CPR tasks if you have not been trained in first aid or CPR.

**Figure C**  
**Incident Flowchart**



Revised: 6/8/2023

*Responsibility is taken, not given. Take responsibility for safety.*



## **Non-Personal Incident Response Procedures**

All incidents including, but not limited to, fire, explosion, property damage, or environmental release will be responded to in accordance with the site-specific HASP. In general, this includes securing the site appropriate to the incident, turning control over to the emergency responders, or securing the site and summoning appropriate remedial personnel or equipment. Anchor QEA will immediately notify the client of any major incident, fire, equipment or property damage, or environmental incident with a preliminary report. A full report will be provided within 72 hours.

### ***Spills and Releases of Hazardous Materials***

When required, notify the National Response Center and local state agencies. The following information should be provided to the National Response Center:

- Name and telephone number
- Name and address of incident location
- Time and type of incident
- Name and quantity of materials involved, if known
- Extent of injuries
- Possible hazards to human health or the environment outside the facility

The emergency telephone number for the National Response Center is (800) 424-8802. If hazardous waste is released or produced through control of the incident, verify the following:

- Waste is collected and contained
- Containers of waste are removed or isolated from the immediate site of the emergency
- Treatment or storage of the recovered waste, contaminated soil or surface water, or any other material that results from the incident or its control is provided
- No waste that is incompatible with released material is treated or stored in the facility until cleanup procedures are completed

Verify that all emergency equipment used is decontaminated, recharged, and fit for its intended use before operations are resumed.

## **Near-Miss Reporting**

All near-miss incidents (i.e., those that could have reasonably led to an injury, environmental release, or other incident) must be reported to the FL and PM immediately, so action can be taken to verify that such conditions that led to the near-miss incident are readily corrected to prevent future occurrences.

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## ABBREVIATIONS

|                   |                                                           |
|-------------------|-----------------------------------------------------------|
| ACGIH             | American Conference of Governmental Industrial Hygienists |
| AED               | Automated External Defibrillator                          |
| ALARA             | as low as reasonably achievable                           |
| ANSI              | American National Standards Institute                     |
| APR               | Air-Purifying Respirator                                  |
| ASTM              | ASTM International                                        |
| CDC               | Centers for Disease Control and Prevention                |
| CFR               | Code of Federal Regulations                               |
| DOHS              | Director of Health and Safety                             |
| COC               | chemical of concern                                       |
| CPR               | cardiopulmonary resuscitation                             |
| CRZ               | Contamination Reduction Zone                              |
| dBA               | A-weighted decibel                                        |
| dB                | decibel                                                   |
| DOT               | U.S. Department of Transportation                         |
| DPT               | direct push technology                                    |
| EPA               | U.S. Environmental Protection Agency                      |
| eV                | electron volts                                            |
| EZ                | Exclusion Zone/Hot Zone                                   |
| FID               | flame ionization detector                                 |
| FL                | Field Lead                                                |
| GFCI              | ground-fault circuit interrupter                          |
| H:V               | horizontal to vertical                                    |
| HASP              | Health and Safety Plan                                    |
| HAZMAT            | Hazardous Materials                                       |
| HAZWOPER          | Hazardous Waste Operations and Emergency Response         |
| HEPA              | high-efficiency particulate air                           |
| HMIS              | Hazardous Material Information System                     |
| IDLH              | immediately dangerous to life or health                   |
| JSA               | Job Safety Analysis                                       |
| kPa               | kilopascal                                                |
| kV                | kilovolt                                                  |
| LEL               | lower-explosive limit                                     |
| LO/TO             | lockout/tagout                                            |
| mg/m <sup>3</sup> | milligram per cubic meter                                 |
| MHR               | maximum heart rate                                        |
| MUTCD             | Manual of Uniform Traffic Control Devices                 |

|                |                                                       |
|----------------|-------------------------------------------------------|
| NEC            | National Electrical Code                              |
| NFPA           | National Fire Protection Association                  |
| NIOSH          | National Institute for Occupational Safety and Health |
| NPL            | National Priority List                                |
| NRR            | Noise Reduction Rating                                |
| O <sub>2</sub> | oxygen                                                |
| OSHA           | Occupational Safety and Health Act or Administration  |
| OV             | organic vapor                                         |
| OVM            | organic vapor monitor                                 |
| PAH            | polycyclic aromatic hydrocarbon                       |
| PE             | Professional Engineer                                 |
| PEL            | Permissible Exposure Limit                            |
| PFD            | personal flotation device                             |
| PID            | photoionization detector                              |
| PM             | Project Manager                                       |
| PPE            | personal protective equipment                         |
| ppm            | parts per million                                     |
| PRCS           | Permit-Required Confined Spaces                       |
| QLFT           | qualitative fit test                                  |
| REL            | Recommended Exposure Limit                            |
| RCRA           | Resource Conservation and Recovery Act                |
| RPP            | Respiratory Protection Program                        |
| SDS            | Safety Data Sheets                                    |
| SZ             | Support Zone/Clean Zone                               |
| TLV            | Threshold Limit Value                                 |
| TSD            | treatment, storage, and disposal                      |
| tsf            | ton per square foot                                   |
| TWA            | time-weighted average                                 |
| TWIC           | Transportation Worker Identification Credential       |
| USCG           | U.S. Coast Guard                                      |
| UV             | ultraviolet                                           |
| VOC            | volatile organic compound                             |
| WBGT           | wet bulb globe temperature                            |
| XRF            | x-ray fluorescence                                    |

# 1 Introduction

This Health and Safety Plan (HASP) was prepared on behalf of Nepera, Inc., and Warner-Lambert Company (Corporate Defendants) and presents health and safety requirements and procedures that will be followed by Anchor QEA, LLC, personnel and at a minimum by Anchor QEA subcontractors during work activities at the Former Nepera Harriman Site (the site). This HASP was developed in accordance with Title 29 of the Code of Federal Regulations (CFR), Part 1910.120(b), and will be used in conjunction with Anchor QEA's Corporate Health and Safety Program. See Section 1.1 for HASP modification procedures.

The provisions of this HASP are mandatory for all Anchor QEA personnel assigned to the project. A copy of this HASP must be maintained on site and available for employee review at all times. Anchor QEA subcontractors are also expected to follow the provisions of this HASP unless they have their own HASP that covers their specific activities related to this project. Any subcontractor HASPs must include the requirements set forth in this HASP, at a minimum. All visitors to the work site must also abide by the requirements of this HASP and will attend a pre-work briefing where the contents of this HASP will be presented and discussed.

Personnel assigned to work at the project site will be required to read this plan and must sign the Health and Safety Plan Acknowledgement Form to confirm that they understand and agree to abide by the provisions of this HASP.

Subcontractors are ultimately responsible for the health and safety of their employees. Subcontractors may mandate health and safety protection measures for their employees beyond the minimum requirements specified in this HASP.

The objectives of this HASP are to identify potential physical, chemical, and biological hazards associated with field activities; establish safe working conditions and protective measures to control those hazards; define emergency procedures; and describe the responsibilities, training requirements, and medical monitoring requirements for site personnel.

This HASP prescribes the procedures that must be followed during specific site activities. Significant operational changes that could affect the health and safety of personnel, the community, or the environment will not be made without the prior approval of the Project Manager (PM) and the Director of Health and Safety (DOHS).

Issuance of this approved HASP documents that the workplace has been evaluated for hazards. A hazard assessment was performed, and the adequacy of the personal protective equipment (PPE) selected was evaluated as required by 29 CFR 1910.132(d)—Personal Protective Equipment, General Requirements (General Industry); 29 CFR 1910.134—Respiratory Protection; 29 CFR 1926.28—Personal Protective Equipment (Construction Industry); and 29 CFR 1926.55—Gases, Vapors, Fumes,

Dusts and Mist, and is duly noted by the signature(s) and date appearing on the certification page of this document.

## **1.1 Health and Safety Plan Modifications**

This HASP will be modified by amendment, if necessary, to address changing field conditions or additional work tasks not already described in this document. Modifications will be proposed by the Field Lead (FL) using the Modification to Health and Safety Plan form included in Appendix A. Modifications will be reviewed by the DOHS or authorized representative and approved by the PM.

## 2 Site Description and Background Information

### 2.1 Site Description

The Former Nepera Harriman Site is located in the Village of Harriman, Orange County, New York. The southwest portion of the Site is located in the Town/Village of Woodbury. The boundaries of the Site are NYS Route 17 to the northwest, the West Branch of the Ramapo River (the river) to the northeast, the Erie Rail line to the west-southwest, and an undeveloped parcel of land currently owned by ELT Harriman, LLC (ELT; the “Avon Parcel”) to the south. The Site encompasses approximately 28 acres and consists of two general areas: 1) approximately 10 acres located to the northeast of Arden House Road, on which the former administrative offices, a parking lot, and the former wastewater (now State Pollutant Discharge Elimination System [SPDES]) lagoon are located; and 2) approximately 18 acres to the southwest of Arden House Road, on which the former manufacturing facilities were located. The owner and operator of the Site at the time of the issuance of this HASP is ELT Harriman, LLC.

### 2.2 Site Background Information

The former Nepera Harriman facility was previously used to manufacture fine and bulk pharmaceutical chemicals from 1942 to 2005. During the period 1945 through 2005 chemical by-products were incinerated at the Site, initially through open pit burning and subsequently in a Resource Conservation and Recovery Act (RCRA) Part B-permitted incinerator (shut down in 2005). Calcium sulfate material, used as part of the manufacturing processes, was disposed of in the area of the former administrative office building and the parking lot. The existing wastewater lagoon (adjacent to the eastern boundary of the Site) was constructed in the 1960s, southeast of the parking lot. The lagoon had served as a settling pond for aluminum hydroxide and magnesium silicate precipitates generated during the manufacturing process.

Additionally, wastewater consisting of boiler blowdown, noncontact cooling water, stormwater runoff, and treated groundwater were also discharged to the lagoon prior to the plant shutdown. All buildings and above-grade structures were demolished in 2015, and the lagoon currently stores stormwater runoff from the Site and discharges to the West Branch of the Ramapo River under a SPDES permit.

## 3 Scope of Work

### 3.1 Project Scope of Work

This plan addresses health and safety issues associated with the following field tasks:

- Site visits which consist of the following:
  - Inspecting and photographing interim cover along the West Branch of the Ramapo River
  - Inspecting and photographing parking lot pavement
  - Inspecting the condition of monitoring wells
  - Inspecting and photographing backfill at former excavation areas: Area F and Building 35
  - Inspecting site-wide fencing
- Site investigation activities:
  - Groundwater well installation
  - Groundwater quality sampling, which is conducted on a schedule of every five quarters. This work consists of the following:
    - Measurement of groundwater levels in monitoring wells
    - Collection of groundwater samples from monitoring wells installed in the overburden aquifer and bedrock
    - Sampling, which will be done with a bladder pump using U.S. Environmental Protection Agency (EPA) Low Flow Sampling procedures
      - When an electric compressor is insufficient for the depth of the well, compressed nitrogen gas will be used. If tanks are needed, they should be transported to the site by the vendor. Tanks will only be used in open air (not closed structures). Tanks will be fully vented before transport off site.
    - Samples will be placed in a cooler and shipped to the laboratory under chain-of-custody (COC)
  - Soil sampling
    - Soil borings will be advanced via Geoprobe and continuously sampled. Soils will be observed for physical properties and screened in the field using a photoionization detector (PID).
  - Surface water sampling:
    - Surface water samples will be collected for analysis of PFAS compounds from the North Branch of the Ramapo River (stream), the Mary Harriman Park Pond, the Harriman Sewage Treatment Plant discharge, and the West Branch of the Ramapo River.



- The collection of surface water samples as part of prior investigations has demonstrated that access to the stream is difficult due to steep, near vertical banks, heavy vegetation along the banks and numerous fallen trees across the stream. Accessing the stream using a boat is not feasible due to shallow stretches and numerous fallen trees. Conversely, wading down the stream is also not feasible due to fallen trees as well as stretches that are deep (over topping waders). Therefore, access can only be attained from the shore and wading limited distances within the stream for sample collection.

## 4 Authority and Responsibilities of Key Personnel

This section describes the authority and responsibilities of key Anchor QEA project personnel. The names and contact information for the following key safety personnel are listed in the Site Emergency Procedures section at the beginning of this HASP. Should key site personnel change during the course of the project, a new list will be established and posted immediately at the site. The emergency phone number for the site is **911** and should be used for all medical, fire, and police emergencies.

### 4.1 Project Manager

The PM provides overall direction for the project. The PM is responsible for ensuring that the project meets the client's objectives in a safe and timely manner. The PM is responsible for providing qualified staff for the project and adequate resources and budget for the health and safety staff to carry out their responsibilities during the field work. The PM will be in regular contact with the FL and DOHS to verify that appropriate health and safety procedures are implemented into each project task.

The PM has authority to direct response operations; the PM assumes total control over project activities but may assign responsibility for aspects of the project to others. In addition, the PM performs the following tasks:

- Overseeing the preparation and organization of background review of the project, the Scope of Work, and the field team
- Verifying that the team obtains permission for site access and coordinates activities with appropriate officials
- Briefing the FL and field personnel on specific assignments
- Together with the FL, seeing that health and safety requirements are met
- Consulting with the DOHS regarding unsafe conditions, incidents, or changes in site conditions or the Scope of Work

### 4.2 Field Lead

The FL reports to the PM, has authority to direct response operations, and assumes control over on-site activities. The FL will direct field activities, will coordinate the technical and health and safety components of the field program, and is responsible in general for enforcing this site-specific HASP and Corporate Health and Safety Program requirements. The FL will be the primary point of contact for all field personnel and visitors and has direct responsibility for implementation and administration of this HASP. The FL and any other member of the field team have **STOP WORK AUTHORITY**—the authority to stop or suspend work in the event of an emergency, if conditions arise that pose an unacceptable health and safety risk to the field team or environment, or if

conditions arise that warrant modifications to this HASP. It is critical that both the FL and PM communicate regularly to proactively identify and address any safety-related concerns that may arise. The functions of the FL related to this HASP include, but are not necessarily limited to, the following:

- Conducting and documenting daily safety meetings or designate an alternate FL in his or her absence
- Executing the Scope of Work and schedule
- Conducting periodic field health and safety inspections to verify compliance with this HASP
- Overseeing implementation of safety procedures
- Implementing site personnel protection levels
- Enforcing site control measures to help verify that only authorized personnel are allowed on site
- Notifying, when necessary, local public emergency officials (all personnel on site may conduct this task as needed)
- Following up on incident reports to the PM
- Periodically inspecting protective clothing and equipment for adequacy and safety compliance
- Verifying that protective clothing and equipment are properly stored and maintained
- Performing or overseeing air monitoring (if required) in accordance with this HASP
- Maintaining and overseeing operation of monitoring equipment and interpretation of data from the monitoring equipment
- Monitoring site personnel for signs of stress, including heat stress, overexertion, cold exposure, and fatigue
- Requiring participants to use the "buddy" system in performing tasks
- Providing (via implementation of this HASP) emergency procedures, evacuation routes, and telephone numbers for the local hospital, poison control center, fire department, and police department
- Communicating incidents promptly to the PM
- Maintaining communication with the DOHS regarding on-site activities
- If applicable, verifying that decontamination and disposal procedures are followed
- Maintaining the availability of required safety equipment
- Advising appropriate health services and medical personnel of potential exposures
- Notifying emergency response personnel in the event of an emergency and coordinate emergency medical care

The FL will record health-and-safety-related details of the project in the field logbook. At a minimum, each day's entries must include the following information:

- Project name or location

- Names of all on-site personnel
- Level of PPE worn and any other specifics regarding PPE
- Weather conditions
- Type of field work being performed

The FL will have completed the required Occupational Safety and Health Administration (OSHA) 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training and annual updates, the 8-hour Supervisor training, medical monitoring clearance, and current first aid and cardiopulmonary resuscitation (CPR) training. Other certifications or training may be stipulated based on client or site requirements.

### **4.3 Director of Health and Safety**

The DOHS (or designee) will be responsible for managing on-site health and safety activities and will provide support to the PM and FL on health and safety-related issues. The following are specific duties of the DOHS:

- Providing technical input into the design and implementation of this HASP
- Advising on the potential for occupational exposure to project hazards, along with appropriate methods and/or controls to eliminate site hazards
- Verifying that a hazard assessment has been performed and that the adequacy of the PPE selected was evaluated as required by 29 CFR 1910.132(d), 29 CFR 1910.134, 29 CFR 1926.25, and 29 CFR 1926.55, and is duly noted by the signatures and date appearing on the Certification Page of this document
- Consulting with the FL on matters relating to suspending site activities in the event of an emergency
- Verifying that all on-site Anchor QEA personnel and subcontractors have read and signed the HASP Acknowledgement Form
- Verifying that corrective actions resulting from deficiencies identified by audit and observations are implemented and effective

The DOHS or designee will have completed the required OSHA 40-hour HAZWOPER training and annual updates as well as the 8-hour Supervisor training (or a minimum of 5 years of supervisory experience).

### **4.4 Project Field Team**

All project field team members will attend a project-specific meeting conducted by the FL concerning safety issues and project work task review before beginning work on site. All field team members, including subcontractors, must be familiar with and comply with this HASP. The field team has the responsibility to immediately report any potentially unsafe or hazardous conditions to the FL,

and all members of the field team have **STOP WORK AUTHORITY**—the authority to stop or suspend work if conditions arise that pose an unacceptable health and safety risk to the field team or environment, or if conditions arise that warrant modifications to this HASP. It is critical that all field team members proactively communicate with the FL to identify potential unsafe conditions. The field team reports to the FL for on-site activities and is responsible for the following:

- Reviewing and maintaining a working knowledge of this HASP
- Safely completing on-site tasks required to fulfill the Scope of Work
- Complying with the HASP
- Attending and participating in daily safety meetings
- Notifying the FL of existing or potential safety conditions at the site
- Reporting all incidents to the FL
- Demonstrating safety and health-conscious conduct

Per OSHA 1910.120(e)(3)(i),<sup>2</sup> newly assigned HAZWOPER 40-hour trained field team members must have at least 3 days of field work supervised by an experienced FL (preferably an individual with HAZWOPER Supervisor training). It is the responsibility of the PM to identify such “short service” personnel and verify that their supervised field experience occurs (or has occurred) and is documented in the project field notes and on the Daily Safety Briefing form (Appendix A).

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<sup>2</sup> “General site workers (such as equipment operators, general laborers and supervisory personnel) engaged in hazardous substance removal or other activities which expose or potentially expose workers to hazardous substances and health hazards shall receive a minimum of 40 hours of instruction off the site, and a minimum of three days actual field experience under the direct supervision of a trained experienced supervisor.”

## 5 Project-Specific Requirements

This section provides activity-specific levels of protection and air monitoring requirements to be used on this site based on the Scope of Work and the chemicals of concern (COCs).

### 5.1 Activity-Specific Level of Protection Requirements

Refer to Section 10 for general requirements for PPE. Level D is the minimum acceptable level for most sites. An upgrade to Modified Level D occurs when there is a possibility that contaminated media can come in contact with the skin or work uniform. An upgrade to Level C occurs when there is a potential for exposure to airborne COCs (i.e., if the results of air monitoring reveal that action levels have been exceeded). Hearing protection must be worn when there are high noise levels. Site personnel must maintain proficiency in the use and care of PPE that is to be worn.

Table 5-1 describes the specific means of protection needed for each identified work activity.

### 5.2 Project Air Monitoring Requirements

Refer to Section 11 of this plan for general requirements for air monitoring at the project site, including information on air monitoring equipment. Upgrade from Level D and/or Modified Level D to Level C when the results of air monitoring reveals that action levels have been exceeded. Use of Level C by Anchor QEA staff requires participation in Anchor QEA's Respiratory Protection Program (RPP).

Table 5-2 describes the specific air monitoring required for each identified work activity.

**Table 5-1**  
**Project Job Tasks and Required Personal Protective Equipment**

| Job Tasks                                                     |                                     | PPE Requirements                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------------------------|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>Site Visits</li> </ul> | <input checked="" type="checkbox"/> | Standard work uniform/coveralls                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                               | <input checked="" type="checkbox"/> | Work boots with safety toe conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                                               | <input type="checkbox"/>            | Disposable shoe covers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                               | <input checked="" type="checkbox"/> | High-visibility traffic safety vest                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                               | <input type="checkbox"/>            | Chemical-resistant clothing <u>check appropriate garments</u> :<br><div style="display: flex; justify-content: space-between;"> <div> <input type="checkbox"/> One-piece coverall<br/> <input type="checkbox"/> Disposable chemical coveralls<br/> <input type="checkbox"/> Bib-style overalls and jacket with hood           </div> <div> <input type="checkbox"/> Hooded one- or two-piece chemical splash suit<br/> <input type="checkbox"/> Chemical-resistant hood and apron           </div> </div> <p><b>Fabric Type:</b> Tyvek<br/>           NOTE: Thick rain pants and coveralls may be substituted for coated Tyvek if sediments are not obviously contaminated with polycyclic aromatic hydrocarbons (PAHs) or related petroleum products. Rain slickers cannot be effectively decontaminated of tar/petroleum contamination.</p> |
|                                                               | <input checked="" type="checkbox"/> | Disposable inner gloves (latex or equivalent "surgical")                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                                               | <input checked="" type="checkbox"/> | General purpose gloves <b>Material Type:</b> Nitrile                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                                               | <input type="checkbox"/>            | Chemical-resistant boots with safety toe conforming to ASTM F2412-05/ASTM F2413-05 or disposable boot covers for safety toe/work boots<br><b>Material Type:</b> Rubber or leather                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                                               | <input type="checkbox"/>            | Puncture-resistant shanks in safety shoes conforming to ASTM F2412-05/ASTM F2413-05                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                               | <input type="checkbox"/>            | Metatarsal guards conforming to ASTM F2412-05/ASTM F2413-05                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                               | <input type="checkbox"/>            | Sleeves to be duct-taped over gloves and pants to be duct-taped over boots                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                               | <input type="checkbox"/>            | Splash-proof safety goggles                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                               | <input checked="" type="checkbox"/> | Safety glasses                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                               | <input type="checkbox"/>            | Hard hat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                                               | <input type="checkbox"/>            | Hard hat with face shield                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                                               | <input checked="" type="checkbox"/> | Hearing protectors ( <b>REQUIRED</b> if site noise levels are greater than 85 decibels [dB] based on an 8-hour time-weighted average [TWA]). <b>Type:</b> ear plugs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

| Job Tasks                                                                                                                                   | PPE Requirements                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                             | <input type="checkbox"/> Two-way radio communication (intrinsically safe, if explosive atmosphere is a potential)<br><input type="checkbox"/> Long cotton underwear<br><input checked="" type="checkbox"/> High-visibility, U.S. Coast Guard (USCG)-approved personal flotation device (PFD) (if working on any water vessel or without fall protection within 10 feet of water)<br><input type="checkbox"/> USCG-approved float coat and bib-overalls (e.g., full two-piece “Mustang” survival suit or similar) or one-piece survival suit if combined air and water temperature is below 90°F<br><input type="checkbox"/> Half-face Air-Purifying Respirator (APR) (OSHA/NIOSH-approved)<br><input type="checkbox"/> Full-face APR (OSHA/NIOSH-approved)<br><input type="checkbox"/> <b>Type of Cartridges to be Used:</b><br><input type="checkbox"/> OV or <input type="checkbox"/> OV/HEPA (if samples are dry)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <ul style="list-style-type: none"> <li>Drilling oversight, absorbent sock handling, surface water, groundwater and soil sampling</li> </ul> | <input checked="" type="checkbox"/> Standard work uniform/coveralls<br><input checked="" type="checkbox"/> Work boots with safety toe conforming to ASTM F2412-05/ASTM F2413-05<br><input type="checkbox"/> Disposable shoe covers<br><input checked="" type="checkbox"/> High-visibility traffic safety vest<br><div style="display: flex; align-items: flex-start;"> <div style="margin-right: 20px;"> <input type="checkbox"/> </div> <div> <p>Chemical-resistant clothing <u>check appropriate garments:</u></p> <div style="display: flex; justify-content: space-between;"> <div> <input type="checkbox"/> One-piece coverall<br/> <input type="checkbox"/> Disposable chemical coveralls<br/> <input type="checkbox"/> Bib-style overalls and jacket with hood </div> <div> <input type="checkbox"/> Hooded one- or two-piece chemical splash suit<br/> <input type="checkbox"/> Chemical-resistant hood and apron </div> </div> <p><b>Fabric Type:</b> Tyvek</p> <p>NOTE: Thick rain pants and coveralls may be substituted for coated Tyvek if sediments are not obviously contaminated with PAHs or related petroleum products. Rain slickers cannot be effectively decontaminated of tar/petroleum contamination.</p> </div> </div> <input checked="" type="checkbox"/> Disposable inner gloves (latex or equivalent “surgical”)<br><input checked="" type="checkbox"/> General purpose gloves<br><p><b>Material Type:</b> Nitrile</p> <input type="checkbox"/> Chemical-resistant boots with safety toe and steel shank conforming to ASTM F2412-05/ASTM F2413-05 or disposable boot covers for safety toe/work boots<br><p><b>Material Type:</b> Rubber or leather</p> <input type="checkbox"/> Puncture-resistant shanks in safety shoes conforming to ASTM F2412-05/ASTM F2413-05 |



| Job Tasks | PPE Requirements                                                                                                                                                                                            |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           | <input type="checkbox"/> Metatarsal guards conforming to ASTM F2412-05/ASTM F2413-05                                                                                                                        |
|           | <input type="checkbox"/> Sleeves to be duct-taped over gloves and pants to be duct-taped over boots                                                                                                         |
|           | <input type="checkbox"/> Splash-proof safety goggles                                                                                                                                                        |
|           | <input checked="" type="checkbox"/> Safety glasses                                                                                                                                                          |
|           | <input checked="" type="checkbox"/> Hard hat                                                                                                                                                                |
|           | <input type="checkbox"/> Hard hat with face shield                                                                                                                                                          |
|           | <input checked="" type="checkbox"/> Hearing protectors ( <b>REQUIRED</b> if site noise levels are greater than 85 dB based on an 8-hour TWA). <b>Type:</b> ear-plugs                                        |
|           | <input type="checkbox"/> Two-way radio communication (intrinsically safe, if explosive atmosphere is a potential)                                                                                           |
|           | <input type="checkbox"/> Long cotton underwear                                                                                                                                                              |
|           | <input checked="" type="checkbox"/> High-visibility, USCG-approved PFD (if working on any water vessel or without fall protection within 10 feet of water)                                                  |
|           | <input type="checkbox"/> USCG-approved float coat and bib-overalls (e.g., full two-piece "Mustang" survival suit or similar) or one-piece survival suit if combined air and water temperature is below 90°F |
|           | <input checked="" type="checkbox"/> Chest waders and wading staff (if surface water sampling requires wading)                                                                                               |
|           | <input type="checkbox"/> Half-face APR (OSHA/NIOSH-approved)                                                                                                                                                |
|           | <input checked="" type="checkbox"/> Full-face APR (OSHA/NIOSH-approved) if handling absorbent socks or if benzene levels are detected in the breathing zone at or above 0.1 ppm)                            |
|           | <input type="checkbox"/> <b>Type of Cartridges to be Used:</b><br><input type="checkbox"/> OV or <input type="checkbox"/> OV/HEPA (if samples are dry)                                                      |
|           | <input checked="" type="checkbox"/> Standard work uniform/coveralls; shirts with long sleeves                                                                                                               |

| Job Tasks                                                                    |                                     | PPE Requirements                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------------------------------------------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>Nitrogen Cylinder Handling</li> </ul> | <input checked="" type="checkbox"/> | Work boots with safety toe conforming to ASTM F2412-05/ASTM F2413-05                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                                              | <input type="checkbox"/>            | Disposable shoe covers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                                                              | <input checked="" type="checkbox"/> | High-visibility traffic safety vest                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                              | <input type="checkbox"/>            | Chemical-resistant clothing ( <u>check appropriate garments</u> ): <div> <input type="checkbox"/> One-piece coverall               <input type="checkbox"/> Hooded one- or two-piece chemical splash suit             </div> <div> <input type="checkbox"/> Disposable chemical-resistant coveralls               <input type="checkbox"/> Chemical-resistant hood and apron             </div> <div> <input type="checkbox"/> Bib-style overalls and jacket with hood             </div> <p><b>Fabric Type:</b> Tyvek</p> <p>NOTE: Thick rain pants and coveralls may be substituted for coated Tyvek if sediments are not obviously contaminated with PAHs or related petroleum products. Rain slickers cannot be effectively decontaminated of tar/petroleum contamination.</p> |
|                                                                              | <input type="checkbox"/>            | Disposable inner gloves (latex or equivalent "chemical resistant")                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                                                              | <input checked="" type="checkbox"/> | General work gloves for handling cylinders<br><b>Material Type:</b> nitrile                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                                              | <input type="checkbox"/>            | Chemical-resistant boots with safety toe and steel shank conforming to ASTM F2412-05/ASTM F2413-05 or disposable boot covers for safety toe/work boots<br><b>Material Type:</b> Rubber or leather                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                                                              | <input type="checkbox"/>            | Puncture-resistant shanks in safety shoes conforming to ASTM F2412-05/ASTM F2413-05                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                              | <input type="checkbox"/>            | Metatarsal guards conforming to ASTM F2412-05/ASTM F2413-05                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                                              | <input type="checkbox"/>            | Sleeves to be duct-taped over gloves and pants to be duct-taped over boots                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                                                              | <input type="checkbox"/>            | Splash-proof safety goggles                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                                              | <input checked="" type="checkbox"/> | Safety glasses with side shields                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                                              | <input checked="" type="checkbox"/> | Hard hat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                              | <input type="checkbox"/>            | Hard hat with face shield                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                                                              | <input type="checkbox"/>            | Hearing protectors ( <b>REQUIRED</b> if site noise levels are greater than 85 dB based on an 8-hour TWA). <b>Type:</b> earplugs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                              | <input type="checkbox"/>            | Two-way radio communication (intrinsically safe if explosive atmosphere is a potential)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                                              | <input type="checkbox"/>            | Long cotton underwear                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                              | <input checked="" type="checkbox"/> | High-visibility, USCG-approved PFD (if working on any water vessel or without fall protection within 10 feet of water)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

| Job Tasks | PPE Requirements         |                                                                                                                                                                                    |
|-----------|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           | <input type="checkbox"/> | USCG-approved float coat and bib-overalls (e.g., full two-piece “Mustang” survival suit or similar) or one-piece survival suit if combined air and water temperature is below 90°F |
|           | <input type="checkbox"/> | Chest waders and wading staff (if surface water sampling requires wading)                                                                                                          |
|           | <input type="checkbox"/> | Half-face APR (OSHA/NIOSH-approved)                                                                                                                                                |
|           | <input type="checkbox"/> | Full-face APR (OSHA/NIOSH-approved)                                                                                                                                                |
|           | <input type="checkbox"/> | <b>Type of Cartridges to be Used:</b><br><input type="checkbox"/> OV or <input type="checkbox"/> OV/HEPA (if samples are dry)                                                      |

**Table 5-2**  
**Project Air Monitoring Requirements**

| <b>Instrument*</b>                                                    | <b>Job Tasks/Functions</b>                                                                                                                                                                       | <b>Measurement</b>                                                                                       | <b>Monitoring Schedule<sup>3</sup></b> | <b>Actions<sup>1</sup></b>                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FID and/or PID<br>(11.7*eV Lamp;<br>Measures Total<br>Organic Vapors) | Conduct air monitoring for VOCs during activities where contaminated media are present. Make sure that a background reading is taken before the start of activities and periodically thereafter. | 0 to 0.1 ppm above background in breathing zone<br><br>0 to 5 ppm if Benzene is shown not to be present. | Continuously                           | Acceptable, continue work.                                                                                                                                                                                                                                                                                                                               |
|                                                                       |                                                                                                                                                                                                  | > 0.1 above background (sustained reading)<br><br>If Benzene is not present, then 25 ppm is the AL.      | Continuously                           | Stop work, evacuate the work area, and contact DOHS for guidance. If approved, upgrade to Level C <sup>4</sup> protection. Monitor for any low exposure limit COCs that could be present based on site history and/or previous sampling data (i.e., vinyl chloride, hydrogen cyanide, and benzene) using colorimetric detector tubes as described below. |
|                                                                       |                                                                                                                                                                                                  | > 1 ppm above background in breathing zone                                                               |                                        | Stop work required. <sup>2</sup> Leave work area and contact PM and DOHS for guidance.                                                                                                                                                                                                                                                                   |

| <b>Instrument*</b>                                                    | <b>Job Tasks/Functions</b>                                                                                                                                                                                                      | <b>Measurement</b>                                                  | <b>Monitoring Schedule<sup>3</sup></b> | <b>Actions<sup>1</sup></b>                                                                                                                                                                             |
|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mercury Vapor Analyzer<br>(Jerome J405, 431-X or similar device)      | Conduct air monitoring for mercury vapors during activities where it may be a contaminant of concern based on site history and/or previous sampling data.                                                                       | 0 to 0.025 mg/m <sup>3</sup> above background in the breathing zone | Periodically (every 15 to 30 minutes)  | Acceptable, continue work.                                                                                                                                                                             |
|                                                                       |                                                                                                                                                                                                                                 | > 0.025 to 0.25 mg/m <sup>3</sup> above background                  | Periodically (every 15 minutes)        | Stop work, evacuate the work area, and contact DOHS for guidance.<br>If approved, upgrade to Level C <sup>4</sup> protection using combination cartridges designed for protection from mercury vapors. |
|                                                                       |                                                                                                                                                                                                                                 | > 0.25 mg/m <sup>3</sup> above background                           |                                        | Stop work required. <sup>2</sup> Leave work area and contact PM and DOHS for guidance.                                                                                                                 |
| Vinyl Chloride Colorimetric Detector Tubes                            | Conduct air monitoring for vinyl chloride during activities where it may be a contaminant of concern based on site history and/or previous sampling data.<br>(Will also detect the presence of other chlorinated hydrocarbons.) | < 1 ppm                                                             | Periodically (every 15 to 30 minutes)  | Acceptable, continue work.                                                                                                                                                                             |
|                                                                       |                                                                                                                                                                                                                                 | > 1 ppm                                                             |                                        | Stop work required. <sup>2</sup> Leave work area and contact PM and DOHS for guidance.                                                                                                                 |
| Hydrogen Cyanide Colorimetric Detector Tubes or Real-time Gas Monitor | Conduct air monitoring for hydrogen cyanide where it may be a contaminant of concern based on site history and/or previous sampling data.                                                                                       | < 5 ppm                                                             | Periodically (every 15 to 30 minutes)  | Acceptable, continue work.                                                                                                                                                                             |
|                                                                       |                                                                                                                                                                                                                                 | > 5 ppm                                                             |                                        | Stop work required. <sup>2</sup> Leave work area and contact PM and DOHS for guidance.                                                                                                                 |

| <b>Instrument*</b>                                                                                                  | <b>Job Tasks/Functions</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Measurement</b>              | <b>Monitoring Schedule<sup>3</sup></b>       | <b>Actions<sup>1</sup></b>                                                                                                                                                                                                                                                                       |
|---------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Benzene<br>Colorimetric<br>Detector Tube                                                                            | Conduct air monitoring for benzene during activities where contaminated media are present. Monitor in the workers' breathing zone.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | < 0.1 ppm                       | Periodically (every 15 to 30 minutes)        | Acceptable, continue work.                                                                                                                                                                                                                                                                       |
|                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | > 0.1 ppm                       | Periodically (every 15 minutes)              | Upgrade to modified Level C <sup>4</sup> respiratory protection.                                                                                                                                                                                                                                 |
|                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | > 5.0 ppm                       | Periodically (every 15 minutes)              | Stop work required. <sup>2</sup> Leave work area and contact PM and DOHS for guidance.                                                                                                                                                                                                           |
| O <sub>2</sub> /LEL Meter<br>(Measures<br>Oxygen Level<br>[O <sub>2</sub> ] and Lower-<br>Explosive Limit<br>[LEL]) | <p>Conduct air monitoring for O<sub>2</sub>/LEL when conditions exist where flammable vapors or gases and/or oxygen deficiency or enrichment can occur.</p> <p>A decreased O<sub>2</sub> reading of 0.1% (e.g., 20.9% to 20.8%) actually represents a change in the total air envelope of approximately 0.5% or 5,000 ppm. This represents little hazard if the displacing gas is inert; if the displacing gas is toxic, flammable, or reactive, such a concentration represents a real hazard.</p> <p>Verify reasons for O<sub>2</sub> depletion by conducting air monitoring with instruments that can measure suspected contaminants (PID/FID) or that can confirm the presence of contaminants (detector tubes or chemical-specific real-time air monitors).</p> | O <sub>2</sub> = 20.8%          | Periodically (every 15 to 30 minutes)        | Acceptable, continue operations.                                                                                                                                                                                                                                                                 |
|                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | O <sub>2</sub> > 19.5% to 20.8% | Continuous monitoring while in the work area | Verify reasons for O <sub>2</sub> depletion with appropriate air monitoring instrumentation before work continues. Utilize appropriate engineering controls (ventilation) once atmospheric contaminants have been verified.                                                                      |
|                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | O <sub>2</sub> > 20.8% to 22%   | Continuous monitoring while in the work area | Verify reasons for O <sub>2</sub> enrichment before entering the area. Utilize appropriate engineering controls/PPE to control O <sub>2</sub> -enriched atmosphere.                                                                                                                              |
|                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | O <sub>2</sub> > 22%            |                                              | Stop work and leave the area immediately; this atmosphere is extremely flammable. Notify PM or DOHS for guidance.                                                                                                                                                                                |
|                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | O <sub>2</sub> < 19.5%          |                                              | Stop work and leave the area immediately; this atmosphere is oxygen-deficient. Verify reasons for O <sub>2</sub> depletion with appropriate air monitoring instrumentation before work continues. Utilize appropriate engineering controls/PPE once atmospheric contaminants have been verified. |

| Instrument*                        | Job Tasks/Functions                                                                                                                                                                                                                                                                                                                    | Measurement                                        | Monitoring Schedule <sup>3</sup>                        | Actions <sup>1</sup>                                                                                            |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
|                                    |                                                                                                                                                                                                                                                                                                                                        | LEL < 10%                                          | Periodically (every 15 to 30 minutes)                   | Acceptable, continue operations.                                                                                |
|                                    |                                                                                                                                                                                                                                                                                                                                        | LEL > 10%                                          |                                                         | Stop work and leave the area immediately. Contact PM or DOHS for guidance on venting and other safety measures. |
| Dust Monitor (respirable fraction) | Conduct monitoring when dusty conditions are encountered in areas that contain potentially contaminated soils. Monitor in employee breathing zones and general areas. Determine if potentially contaminated materials are migrating off-site.<br><br>Dust concentration action levels are based on downwind minus upwind measurements. | < 0.3 mg/m <sup>3</sup>                            | Initially and every 15 minutes while conditions persist | Continue work.                                                                                                  |
|                                    |                                                                                                                                                                                                                                                                                                                                        | 0.3 mg/m <sup>3</sup> and greater above background | Continuously                                            | Stop work, evacuate the work area, and contact DOHS for guidance.                                               |

\*Note: Instruments must be calibrated according to manufacturer's recommendations.

1. For VOCs, a sustained reading for greater than 2 minutes in excess of the action level will trigger a protective measure.
2. Contact with the DOHS and PM must be made prior to continuance of work. A hazard review must be conducted before proceeding with work. Corrective actions may include temporary work stoppage to allow vapors to dissipate, and then returning to work if air monitoring data permits.
3. Monitoring frequency is from the beginning of each task and at specified intervals thereafter, or when detectable soil contamination is encountered (as indicated by strong, sustained odor, visual evidence of product, or petroleum-discolored soils).
4. Work must be conducted in accordance with Anchor QEA's RPP. Contact the DOHS for respiratory protection fit testing and air purifying cartridge change-out requirements.

## 6 Risk Analysis and Control

The following sections discuss the potential health and safety hazards associated with the field tasks described in the Scope of Work. Controls of these hazards are addressed through the mechanical and physical control measures, use of PPE, monitoring, training, decontamination, emergency response, and safety procedures.

Significant changes in the Scope of Work covered by this HASP must be communicated to the PM and DOHS, and a modification to this HASP must be created as needed (see Section 1.1). Any task conducted beyond those identified in the Scope of Work and this HASP must be evaluated using the Job Safety Analysis (JSA) process prior to conducting the work.

### 6.1 Job Safety Analysis

Anchor QEA work tasks have been evaluated for their hazards and JSA documents have been developed that detail the chemical, physical, and biological hazards associated with these tasks along with the control measures (e.g., engineering controls, administrative controls, and/or PPE) that will be used to conduct them in a safe manner.

The PM and FL are responsible for identifying work tasks and project site conditions that are beyond the previously developed JSA documents and for communicating such information to the DOHS. The DOHS will provide support, as needed, to the PM and the FL, who will have primary responsibility to develop project-specific JSAs.

The contents of the JSA documents shall be communicated to project personnel during the site orientation meeting and during daily safety meetings when conducting work where the specific JSAs are applicable.

JSA documents applicable to this project are located in Appendix B and include the following field tasks:

- General field activities
- Groundwater sampling
- Sample and laboratory glassware
- Investigation-derived waste management
- Motor vehicle operation
- Soil sampling
- Surface water sampling
- Drilling oversight
- Wading
- Nitrogen Cylinder Safety
- Absorbent Sock Handling



### **6.1.1 *Augmented Job Safety Analysis Process***

If significant work tasks are identified during the course of the project that were not previously addressed in the JSA documentation supplied in Appendix B, then a task-specific JSA document must be developed prior to conducting the work. The PM and FL shall develop this document(s) with input from the DOHS, as needed, and this HASP will be modified to include the JSA document (see Section 1.1 for HASP modification procedures). Project personnel shall be trained on the contents of the developed task-specific JSA prior to its implementation. Appendix B of this HASP includes a blank JSA form that can be used to create a new task-specific JSA.

## **6.2 Exposure Routes**

Possible routes of exposure to the chemicals potentially encountered on this project include inhalation, dermal contact, and ingestion of dust, mist, gas, vapor, or liquid. Exposure will be minimized by using safe work practices and by wearing the appropriate PPE. A further discussion of PPE requirements is presented in Section 10.

### **6.2.1 *Inhalation***

Inhalation of particulates, dust, mist, gas, or vapor during field activities is possible. Whenever possible, work activities will be oriented so that personnel are upwind of the sampling location. An organic vapor monitor (OVM) may be used to monitor ambient air and the breathing zone within the work area for organic compounds. Section 5.2 describes potential OVM action levels and response procedures.

### **6.2.2 *Dermal Contact***

Dermal contact with potentially contaminated soil, sediment, or groundwater during field activities is possible. Direct contact will be minimized by using appropriate PPE and decontamination procedures.

### **6.2.3 *Ingestion***

Direct ingestion of contaminants can occur by inhaling airborne dust, mist, or vapors, or by swallowing contaminants trapped in the upper respiratory tract. Indirect ingestion can occur by introducing the contaminants into the mouth by way of food, tobacco, fingers, or other carriers. Although ingestion of contaminants can occur, proper hygiene, decontamination, and contamination reduction procedures should reduce the probability of this route of exposure.

## **6.3 Chemicals of Concern Profile**

Table 6-1 provides a summary profile for the COCs for this project. As available, this profile is based on recent site history and site characterization information. For more detailed and specific

information, always refer to the Safety Data Sheet (SDS) or equivalent information for the chemical (see Appendix C).

**Table 6-1**  
**Chemicals of Concern Profile**

| Chemical                                           | Exposure Routes                                                             | Symptoms                                                                                                                                                                                                          | Target Organs                                                              | Occupational Exposure Limits                                                                              | Odor Threshold (ppm) | LEL (%) | Ionization Potential (eV) |
|----------------------------------------------------|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|----------------------|---------|---------------------------|
| Ammonia<br>CAS# 7664-41-7                          | Inhalation, ingestion (solution), skin and/or eye contact (solution/liquid) | Irritation eyes, nose, throat; dyspnea (breathing difficulty), wheezing, chest pain; pulmonary edema; pink frothy sputum; skin burns, vesiculation; liquid: frostbite                                             | Eyes, skin, respiratory system                                             | NIOSH REL TWA <sub>8</sub><br>25 ppm (18 mg/m <sup>3</sup> )<br>Short Term 35 ppm (27 mg/m <sup>3</sup> ) | --                   | 15      | 10.18                     |
| Benzene<br>CAS# 71-43-2                            | Inhalation, skin absorption, ingestion, skin and/or eye contact             | Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen] | Eyes, skin, respiratory system, blood, central nervous system, bone marrow | NIOSH REL TWA <sub>8</sub><br>0.1 ppm<br>Short Term 1 ppm                                                 | --                   | 1.2     | 9.24                      |
| Ethylbenzene<br>CAS# 100-41-4                      | Inhalation, ingestion, skin and/or eye contact                              | Irritation eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma                                                                                                                                      | Eyes, skin, respiratory system, central nervous system                     | ACGIH TLV TWA <sub>8</sub><br>20 ppm                                                                      | --                   | 0.8     | 8.76                      |
| Iron Oxide dust and fume (as FE)<br>CAS# 1309-37-1 | Inhalation                                                                  | Benign pneumoconiosis with x-ray shadows indistinguishable from fibrotic pneumoconiosis (siderosis)                                                                                                               | Respiratory System                                                         | NIOSH REL 5 mg/m <sup>3</sup>                                                                             | NA                   | NA      | NA                        |

| Chemical                                                       | Exposure Routes                                                 | Symptoms                                                                                                                                                                                                                                                                            | Target Organs                                                          | Occupational Exposure Limits                                                          | Odor Threshold (ppm) | LEL (%) | Ionization Potential (eV) |
|----------------------------------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------|---------|---------------------------|
| Manganese compounds and fume (as Mn)<br>CAS# 7439-96-5 (metal) | Inhalation, ingestion                                           | Manganism; asthenia, insomnia, mental confusion; metal fume fever: dry throat, cough, chest tightness, dyspnea (breathing difficulty), rales, flu-like fever; low-back pain; vomiting; malaise (vague feeling of discomfort); lassitude (weakness, exhaustion); kidney damage       | Respiratory system, central nervous system, blood, kidneys             | ACGIH TLV TWA <sub>8</sub><br>0.02 mg/m <sup>3</sup><br>Respirable particulate matter | NA                   | NA      | NA                        |
| Mercury (all forms except Alkyl)<br>CAS# 7439-97-6             | Inhalation, skin absorption, ingestion, skin and/or eye contact | Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria | Eyes, skin, respiratory system, central nervous system, kidneys        | ACGIH TLV TWA <sub>8</sub><br>0.025 mg/m <sup>3</sup>                                 | NA                   | NA      | NA                        |
| Toluene<br>CAS# 108-88-3                                       | Inhalation, skin absorption, ingestion, skin and/or eye contact | Irritation eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage                                               | Eyes, skin, respiratory system, central nervous system, liver, kidneys | ACGIH TWA <sub>8</sub> 20 ppm<br>STEL - 150 ppm<br>Ceiling limit – 300 ppm            | --                   | 1.1     | 8.82                      |

| <b>Chemical</b>            | <b>Exposure Routes</b>                                          | <b>Symptoms</b>                                                                                                                                                                        | <b>Target Organs</b>                                                                                  | <b>Occupational Exposure Limits</b>                    | <b>Odor Threshold (ppm)</b> | <b>LEL (%)</b> | <b>Ionization Potential (eV)</b> |
|----------------------------|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------|-----------------------------|----------------|----------------------------------|
| m-Xylene<br>CASE# 108-38-3 | Inhalation, skin absorption, ingestion, skin and/or eye contact | Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis | Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys | ACGIH TLV TWA <sub>8</sub><br>20 ppm<br>STEL – 150 ppm | --                          | 1.1            | 8.56                             |
| o-Xylene<br>CASE# 97-47-6  | Inhalation, skin absorption, ingestion, skin and/or eye contact | Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis | Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys | ACGIH TLV TWA <sub>8</sub><br>20 ppm<br>STEL – 150 ppm | --                          | 0.9            | 8.56                             |
| p-Xylene<br>CASE# 106-42-3 | Inhalation, skin absorption, ingestion, skin and/or eye contact | Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis | Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys | ACGIH TLV TWA <sub>8</sub><br>20 ppm<br>STEL – 150 ppm | --                          | 1.1            | 8.44                             |

| Chemical                                      | Exposure Routes                                                 | Symptoms                                                                                                                                                          | Target Organs                                                               | Occupational Exposure Limits                                                                                    | Odor Threshold (ppm) | LEL (%) | Ionization Potential (eV) |
|-----------------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|----------------------|---------|---------------------------|
| 2-aminopyridine<br>CAS# 504-29-0              | Inhalation, skin absorption, ingestion, skin and/or eye contact | Irritation eyes, nose, throat; headache, dizziness; excitement; nausea; high blood pressure; resp distress; lassitude (weakness, exhaustion); convulsions; stupor | Central nervous system, respiratory system                                  | OSHA PEL TWA <sub>8</sub><br>0.5 ppm (2 mg/m <sup>3</sup> )                                                     | --                   | NA      | 8.00                      |
| Pyridine<br>CAS# 110-86-1                     | Inhalation, skin absorption, ingestion, skin and/or eye contact | Irritation eyes; headache, anxiety, dizziness, insomnia; nausea, anorexia; dermatitis; liver, kidney damage                                                       | Eyes, skin, central nervous system, liver, kidneys, gastrointestinal tract, | ACGIH TLV TWA <sub>8</sub><br>1 ppm (3.1mg/m <sup>3</sup> )                                                     | --                   | 1.8     | 9.27                      |
| Sulfates as Calcium Sulfate<br>CAS# 7778-18-9 | Inhalation, skin and/or eye contact                             | Irritation eyes, skin, upper respiratory system; conjunctivitis; rhinitis, epistaxis (nosebleed)                                                                  | Eyes, skin, respiratory system                                              | NIOSH REL TWA <sub>8</sub><br>10 mg/m <sup>3</sup> Total<br><br>TWA <sub>8</sub> 5 mg/m <sup>3</sup> respirable | --                   | NA      | NA                        |
| Perfluorooctanoic Acid<br>CAS# 335-67-1       | Ingestion, inhalation, dermal contact, eye contact              | Difficulty breathing, toxic if inhaled, severe burns and eye damage, reduced fertility, fetal abnormality, liver damage, cancer                                   | Eyes, lungs, skin, liver                                                    | 0.005 mg/m <sup>3</sup> (Inhalable fraction)<br>TWA <sub>8</sub> (DFG MAKs)                                     | --                   | NA      | N/A                       |
| Perfluorooctane Sulfonate<br>CAS# 1763-23-1   | Ingestion, inhalation, dermal contact, eye contact              | Difficulty breathing, toxic if inhaled, severe burns and eye damage, reduced fertility, fetal abnormality, liver damage, cancer                                   | Eyes, lungs, skin, liver                                                    | 0.01 mg/m <sup>3</sup> (inhalable fraction)<br>TWA <sub>8</sub> (DFG MAKs)                                      | NA                   | NA      | 10.5                      |

| Chemical                             | Exposure Routes                                                 | Symptoms                                                                                                                                                                                                                                          | Target Organs                                                 | Occupational Exposure Limits                                                                                     | Odor Threshold (ppm) | LEL (%) | Ionization Potential (eV) |
|--------------------------------------|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|----------------------|---------|---------------------------|
|                                      | Inhalation, ingestion, skin and/or eye contact                  | Irritation eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid) | Eyes, skin, respiratory system, central nervous system, blood | ACGIH TLV TWA <sub>8</sub> 10 ppm (49 mg/m <sup>3</sup> )                                                        | --                   | 0.9     | 8.27                      |
| 1,2-Dichlorobenzene<br>CAS# 95-50-1  | Inhalation, skin absorption, ingestion, skin and/or eye contact | Irritation eyes, nose; liver, kidney damage; skin blisters                                                                                                                                                                                        | Eyes, skin, respiratory system, liver, kidneys                | ACGIH TLV TWA <sub>8</sub> 25 ppm (150 mg/m <sup>3</sup> )<br><br>ACGIH TLV-STEL 50 ppm (301 mg/m <sup>3</sup> ) | --                   | 2.2     | 9.06                      |
| 1,3-Dichlorobenzene<br>CAS# 541-73-1 | Inhalation, skin absorption, ingestion, skin and/or eye contact | Eye irritation, swelling periorbital (situated around the eye); profuse rhinitis; headache, anorexia, nausea, vomiting; weight loss, jaundice, cirrhosis; In Animals: liver, kidney injury; [potential occupational carcinogen]                   | Liver, respiratory system, eyes, kidneys, skin                | TWA <sub>8</sub> 2 ppm<br>DFG MAKs                                                                               |                      | 2.5     | 8.98                      |

| Chemical                             | Exposure Routes                                                 | Symptoms                                                                                                                                                                                                                                                                | Target Organs                                             | Occupational Exposure Limits                                      | Odor Threshold (ppm) | LEL (%)            | Ionization Potential (eV) |
|--------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|-------------------------------------------------------------------|----------------------|--------------------|---------------------------|
| 1,4-Dichlorobenzene<br>CAS# 106-46-7 | Inhalation, skin absorption, ingestion, skin and/or eye contact | Eye irritation, swelling periorbital (situated around the eye); profuse rhinitis; headache, anorexia, nausea, vomiting; weight loss, jaundice, cirrhosis; In Animals: liver, kidney injury; [potential occupational carcinogen]                                         | Liver, respiratory system, eyes, kidneys, skin            | ACGIH TLV TWA <sub>8</sub><br>10 ppm (60 mg/m <sup>3</sup> )      | --                   | 2.5                | 8.98                      |
| 2-Butanone (MEK)<br>CAS# 78-93-3     | Inhalation, ingestion, skin and/or eye contact                  | Irritation eyes, skin, nose; headache; dizziness; vomiting; dermatitis                                                                                                                                                                                                  | Eyes, skin, respiratory system, central nervous system    | ACGIH TLV TWA <sub>8</sub><br>75 ppm<br>ACGIH TLV STEL<br>150 ppm | NA                   | (at 200°F):<br>1.4 | 9.54                      |
| 2-Methylnaphthalene<br>CAS# 91-57-6  | Inhalation, skin absorption, ingestion, skin and/or eye contact | Irritation eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage | Eyes, skin, blood, liver, kidneys, central nervous system | ACGIH TLV TWA <sub>8</sub><br>0.5 ppm                             |                      | 0.9                | 8.12                      |



| Chemical                                                 | Exposure Routes                                                 | Symptoms                                                                                                                               | Target Organs                                                               | Occupational Exposure Limits                                                       | Odor Threshold (ppm) | LEL (%) | Ionization Potential (eV) |
|----------------------------------------------------------|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------|----------------------|---------|---------------------------|
| 2-Picoline<br>CAS# 109-06-8                              | Inhalation, ingestion or skin absorption                        | Narcosis, headache, nausea, giddiness, vomiting. EYES: Severe irritation. SKIN: Causes burns. INGESTION: Irritation and gastric upset. | Eyes, skin, central nervous system, liver, kidneys, gastrointestinal tract, | AIHA WEEL<br>TWA <sub>8</sub> 2 ppm<br>Skin                                        | NA                   | 1.4     | NA                        |
| 3-Picoline<br>CAS# 108-99-6                              | Inhalation, skin absorption, ingestion, skin and/or eye contact | Irritation eyes; headache, anxiety, dizziness, insomnia; nausea, anorexia; dermatitis; liver, kidney damage                            | Eyes, skin, central nervous system, liver, kidneys, gastrointestinal tract, | AIHA WEEL<br>TWA <sub>8</sub> 2 ppm<br>Skin                                        | NA                   | 1.8     | 9.27                      |
| Acetone<br>CAS# 67-64-1                                  | Inhalation, ingestion, skin and/or eye contact                  | Irritation eyes, nose, throat; headache, dizziness, central nervous system depression; dermatitis                                      | Eyes, skin, respiratory system, central nervous system                      | NIOSH REL<br>TWA <sub>8</sub> 250 ppm<br>(590 mg/m <sup>3</sup> )                  | --                   | 2.5     | 9.69                      |
| Aluminum Metal and Insoluble Compounds<br>CAS# 7429-90-5 | Inhalation, skin and/or eye contact                             | Irritation eyes, skin, respiratory system                                                                                              | Eyes, skin, respiratory system                                              | ACGIH TLV<br>TWA <sub>8</sub> 1 mg/m <sup>3</sup><br>Respirable Particulate Matter | NA                   | NA      | NA                        |

| Chemical                                                                                            | Exposure Routes                                                 | Symptoms                                                                                                                                                                      | Target Organs                                                 | Occupational Exposure Limits                        | Odor Threshold (ppm) | LEL (%) | Ionization Potential (eV) |
|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|-----------------------------------------------------|----------------------|---------|---------------------------|
| Antimony and compounds (as Sb)<br>CAS# 7440-36-0                                                    | Inhalation, ingestion, skin and/or eye contact                  | Irritation eyes, skin, nose, throat, mouth; cough; dizziness; headache; nausea, vomiting, diarrhea; stomach cramps; insomnia; anorexia; unable to smell properly              | Eyes, skin, respiratory system, cardiovascular system         | NIOSH REL<br>TWA <sub>8</sub> 0.5 mg/m <sup>3</sup> | NA                   | NA      | NA                        |
| Arsenic (inorganic compounds, as As)<br>CAS# 7440-38-2                                              | Inhalation, skin absorption, skin and/or eye contact, ingestion | Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, resp irritation, hyperpigmentation of skin, [potential occupational carcinogen] | Liver, kidneys, skin, lungs, lymphatic system                 | NIOSH REL<br>C 0.002 mg/m <sup>3</sup> [15-minute]  | NA                   | NA      | NA                        |
| Barium Chloride and other soluble barium compounds except Barium Sulfate (as Ba)<br>CAS# 10361-37-2 | Inhalation, ingestion, skin and/or eye contact                  | Irritation eyes, skin, upper respiratory system; skin burns; gastroenteritis; muscle spasm; slow pulse, extrasystoles; hypokalemia                                            | Eyes, skin, respiratory system, heart, central nervous system | OSHA PEL<br>TWA <sub>8</sub> 0.5 mg/m <sup>3</sup>  | NA                   | NA      | NA                        |

| Chemical                                                         | Exposure Routes                                | Symptoms                                                                                                                                                                                                                                                                                             | Target Organs                                                 | Occupational Exposure Limits                                                                                                     | Odor Threshold (ppm) | LEL (%) | Ionization Potential (eV) |
|------------------------------------------------------------------|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|----------------------|---------|---------------------------|
| Beryllium & Beryllium compounds (as Be)<br>CAS# 7440-41-7        | Inhalation, skin and/or eye contact            | Berylliosis (chronic exposure): anorexia, weight loss, lassitude (weakness, exhaustion), chest pain, cough, clubbing of fingers, cyanosis, pulmonary insufficiency; irritation eyes; dermatitis; [potential occupational carcinogen]                                                                 | Eyes, skin, respiratory system                                | ACGIH TLV TWA <sub>8</sub><br>0.00005 mg/m <sup>3</sup><br>(Inhalable fraction)<br>0.002 mg/m <sup>3</sup> (30-min Peak)<br>Skin | NA                   | NA      | NA                        |
| Cadmium dust and all Cadmium Compounds (as Cd)<br>CAS# 7440-43-9 | Inhalation, ingestion                          | Pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen] | Respiratory system, kidneys, prostate, blood                  | ACGIH TLV TWA <sub>8</sub><br>0.002 mg/m <sup>3</sup><br>Respirable particulate fraction                                         | NA                   | NA      | NA                        |
| Chlorobenzene<br>CAS# 108-90-7                                   | Inhalation, ingestion, skin and/or eye contact | Irritation eyes, skin, nose; drowsiness, incoordination; central nervous system depression; In Animals: liver, lung, kidney injury                                                                                                                                                                   | Eyes, skin, respiratory system, central nervous system, liver | ACGIH TLV TWA <sub>8</sub><br>10 ppm (46 mg/m <sup>3</sup> )                                                                     | --                   | 1.3     | 9.07                      |

| Chemical                                                     | Exposure Routes                                | Symptoms                                                                                                                                                        | Target Organs                                                                         | Occupational Exposure Limits                                                  | Odor Threshold (ppm) | LEL (%) | Ionization Potential (eV) |
|--------------------------------------------------------------|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|----------------------|---------|---------------------------|
| Chromium and inorganic compounds<br>CAS# 7440-47-3           | Inhalation, ingestion, skin and/or eye contact | Irritation eyes, skin; lung fibrosis (histologic)                                                                                                               | Eyes, skin, respiratory system                                                        | NIOSH REL<br>TWA <sub>8</sub> 0.003 mg/m <sup>3</sup><br>(inhalable fraction) | NA                   | NA      | NA                        |
| Cobalt metal dust and fume (as Co)<br>CAS# 7440-48-4         | Inhalation, ingestion, skin and/or eye contact | Cough, dyspnea (breathing difficulty), wheezing, decreased pulmonary function; weight loss; dermatitis; diffuse nodular fibrosis; resp hypersensitivity, asthma | Skin, respiratory system                                                              | ACGIH TLV<br>TWA <sub>8</sub> 0.02 mg/m <sup>3</sup><br>(inhalable fraction)  | NA                   | NA      | NA                        |
| Copper (and other copper compounds, as Cu)<br>CAS# 7440-50-8 | Inhalation, ingestion, skin and/or eye contact | Irritation eyes, nose, pharynx; nasal septum perforation; metallic taste; dermatitis; In Animals: lung, liver, kidney damage; anemia                            | Eyes, skin, respiratory system, liver, kidneys (increased risk with Wilson's disease) | OSHA PEL<br>TWA <sub>8</sub> 1 mg/m <sup>3</sup><br>Dusts and Mists           | NA                   | NA      | NA                        |

| <b>Chemical</b>                        | <b>Exposure Routes</b>                                          | <b>Symptoms</b>                                                                                                                                                                                                                                                 | <b>Target Organs</b>                                                                  | <b>Occupational Exposure Limits</b>                                     | <b>Odor Threshold (ppm)</b> | <b>LEL (%)</b> | <b>Ionization Potential (eV)</b> |
|----------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-------------------------------------------------------------------------|-----------------------------|----------------|----------------------------------|
| Lead<br>CAS# 7439-92-1                 | Inhalation, ingestion, skin and/or eye contact                  | Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension | Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue | OSHA PEL<br>TWA <sub>8</sub> 0.050 mg/m <sup>3</sup>                    | NA                          | NA             | NA                               |
| Magnesium oxide fume<br>CAS# 1309-48-4 | Inhalation, skin and/or eye contact                             | Irritation eyes, nose; metal fume fever: cough, chest pain, flu-like fever                                                                                                                                                                                      | Eyes, respiratory system                                                              | ACGIH TLV<br>TWA <sub>8</sub> 10 mg/m <sup>3</sup> (inhalable fraction) | NA                          | NA             | NA                               |
| Methylene chloride<br>CAS# 75-09-2     | Inhalation, skin absorption, ingestion, skin and/or eye contact | Irritation eyes, skin; lassitude (weakness, exhaustion), drowsiness, dizziness; numb, tingle limbs; nausea; [potential occupational carcinogen]                                                                                                                 | Eyes, skin, cardiovascular system, central nervous system                             | OSHA PEL<br>TWA <sub>8</sub> 25 ppm<br><br>OSHA PEL<br>STEL 125 ppm     | --                          | 13             | 11.32                            |

| Chemical                                                   | Exposure Routes                                                 | Symptoms                                                                                                                                                                                                                                                                | Target Organs                                                                                              | Occupational Exposure Limits                                | Odor Threshold (ppm) | LEL (%) | Ionization Potential (eV) |
|------------------------------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|----------------------|---------|---------------------------|
| Naphthalene<br>CAS# 91-20-3                                | Inhalation, skin absorption, ingestion, skin and/or eye contact | Irritation eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage | Eyes, skin, blood, liver, kidneys, central nervous system                                                  | OSHA PEL<br>TWA <sub>8</sub> 10 ppm (50 mg/m <sup>3</sup> ) | --                   | 0.9     | 8.12                      |
| n-Butylbenzene<br>CAS# 104-51-8                            | inhalation, ingestion, skin and/or eye contact                  | irritation eyes, skin; dry nose, throat; headache; low blood pressure, tachycardia, abnormal cardiovascular system stress; central nervous system, hematopoietic depression; metallic taste; liver, kidney injury                                                       | Eyes, skin, respiratory system, cardiovascular system, central nervous system, bone marrow, liver, kidneys | TWA <sub>8</sub> 10 ppm DFG<br>MAKs<br>Skin                 | --                   | 0.8     | NA                        |
| Nickel metal and other compounds (as Ni)<br>CAS# 7440-02-0 | Inhalation, ingestion, skin and/or eye contact                  | Sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]                                                                                                                                                                             | Nasal cavities, lungs, skin                                                                                | NIOSH REL<br>TWA <sub>8</sub> 0.015 mg/m <sup>3</sup>       | NA                   | NA      | NA                        |
| n-Propylbenzene<br>CAS# 103-65-1                           | inhalation, ingestion, or skin absorption                       | May cause eye and skin irritation.                                                                                                                                                                                                                                      | Eyes and skin                                                                                              | NA                                                          | NA                   | 0.8     | NA                        |

| <b>Chemical</b>                                                                              | <b>Exposure Routes</b>                                          | <b>Symptoms</b>                                                                                                                                                                                                                                                                              | <b>Target Organs</b>                                                                          | <b>Occupational Exposure Limits</b>                          | <b>Odor Threshold (ppm)</b> | <b>LEL (%)</b> | <b>Ionization Potential (eV)</b> |
|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|--------------------------------------------------------------|-----------------------------|----------------|----------------------------------|
| Pentachlorophenol<br>CAS# 87-86-5                                                            | Inhalation, skin absorption, ingestion, skin and/or eye contact | Irritation eyes, nose, throat; sneezing, cough; lassitude (weakness, exhaustion), anorexia, weight loss; sweating; headache, dizziness; nausea, vomiting; dyspnea (breathing difficulty), chest pain; high fever; dermatitis                                                                 | Eyes, skin, respiratory system, cardiovascular system, liver, kidneys, central nervous system | OSHA PEL<br>TWA <sub>8</sub> 0.5 mg/m <sup>3</sup><br>[skin] | --                          | NA             | NA                               |
| Selenium and other selenium compounds (as Se) except Selenium hexafluoride<br>CAS# 7782-49-2 | Inhalation, ingestion, skin and/or eye contact                  | Irritation eyes, skin, nose, throat; visual disturbance; headache; chills, fever; dyspnea (breathing difficulty), bronchitis; metallic taste, garlic breath, gastrointestinal disturbance; dermatitis; eye, skin burns; In Animals: anemia; liver necrosis, cirrhosis; kidney, spleen damage | Eyes, skin, respiratory system, liver, kidneys, blood, spleen                                 | OSHA PEL<br>TWA <sub>8</sub> 0.2 mg/m <sup>3</sup>           | NA                          | NA             | NA                               |
| Silver (metal dust and soluble compounds, as Ag)<br>CAS# 7440-22-4                           | Inhalation, ingestion, skin and/or eye contact                  | Blue-gray eyes, nasal septum, throat, skin; irritation, ulceration skin; gastrointestinal disturbance                                                                                                                                                                                        | Nasal septum, skin, eyes                                                                      | OSHA PEL<br>TWA <sub>8</sub> 0.01 mg/m <sup>3</sup>          | NA                          | NA             | NA                               |

| Chemical                                              | Exposure Routes                                                 | Symptoms                                                                                                                                                                                                                                                    | Target Organs                                                                                       | Occupational Exposure Limits                                                                                            | Odor Threshold (ppm) | LEL (%) | Ionization Potential (eV) |
|-------------------------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|----------------------|---------|---------------------------|
| Tetrachloroethene (PCE)<br>CAS# 127-18-4              | Inhalation, skin absorption, ingestion, skin and/or eye contact | Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]                                         | Eyes, skin, respiratory system, liver, kidneys, central nervous system                              | ACGIH TLV TWA <sub>8</sub><br>25 ppm (170 mg/m <sup>3</sup> )<br><br>ACGIH TLV STEL<br>100 ppm (685 mg/m <sup>3</sup> ) | --                   | NA      | 9.32                      |
| Thallium (soluble compounds, as Tl)<br>CAS# 7440-28-0 | Inhalation, skin absorption, ingestion, skin and/or eye contact | Nausea, diarrhea, abdominal pain, vomiting; ptosis, strabismus; peri neuritis, tremor; retrosternal (occurring behind the sternum) tightness, chest pain, pulmonary edema; convulsions, chorea, psychosis; liver, kidney damage; alopecia; paresthesia legs | Eyes, respiratory system, central nervous system, liver, kidneys, gastrointestinal tract, body hair | ACGIH TLV TWA <sub>8</sub><br>0.02 mg/m <sup>3</sup><br>Inhalable Particulate Matter                                    | --                   | NA      | NA                        |
| 1,2-Dichloroethene<br>CAS# 540-59-0                   | Inhalation, ingestion, skin and/or eye contact                  | Irritation eyes, respiratory system; central nervous system depression                                                                                                                                                                                      | Eyes, respiratory system, central nervous system                                                    | OSHA PEL<br>TWA <sub>8</sub> 200 ppm (790 mg/m <sup>3</sup> )                                                           | --                   | 5.6     | 9.65                      |



| Chemical                              | Exposure Routes                                                 | Symptoms                                                                                                                                                                                                                                | Target Organs                                                                 | Occupational Exposure Limits                                                                                          | Odor Threshold (ppm) | LEL (%)        | Ionization Potential (eV) |
|---------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------|----------------|---------------------------|
| Trichloroethene (TCE)<br>CAS# 79-01-6 | Inhalation, skin absorption, ingestion, skin and/or eye contact | Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen] | Eyes, skin, respiratory system, heart, liver, kidneys, central nervous system | ACGIH TLV TWA <sub>8</sub><br>10 ppm (54 mg/m <sup>3</sup> )<br><br>ACGIH TLV STEL<br>25 ppm (135 mg/m <sup>3</sup> ) | --                   | (At 77°F)<br>8 | 9.45                      |
| Vanadium Pentoxide<br>CAS# 1314-62-1  | Inhalation, ingestion, skin and/or eye contact                  | Irritation eyes, skin, throat; green tongue, metallic taste, eczema; cough; fine rales, wheezing, bronchitis, dyspnea (breathing difficulty)                                                                                            | Eyes, skin, respiratory system                                                | ACGIH TLV TWA <sub>8</sub><br>0.05 mg/m <sup>3</sup><br>Inhalable particulate matter, measured as vanadium            | NA                   | NA             | NA                        |
| Vinyl chloride<br>CAS# 75-01-4        | Inhalation, skin and/or eye contact (liquid)                    | Lassitude (weakness, exhaustion); abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; [potential occupational carcinogen]                                                  | Liver, central nervous system, blood, respiratory system, lymphatic system    | OSHA PEL<br>TWA <sub>8</sub> 1 ppm<br>Ceiling 5 ppm [15-minute]                                                       | --                   | 2.21           | 9.99                      |

| Chemical                                                   | Exposure Routes                                                 | Symptoms                                                                                                                                                                                                                                                                                                  | Target Organs                          | Occupational Exposure Limits                                                                                                                                                                                                                          | Odor Threshold (ppm) | LEL (%) | Ionization Potential (eV) |
|------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------|---------------------------|
| Zinc<br>CAS# 7440-66-6                                     | Inhalation                                                      | Metal fume fever: chills, muscle ache, nausea, fever, dry throat, cough; lassitude (weakness, exhaustion); metallic taste; headache; blurred vision; low back pain; vomiting; malaise (vague feeling of discomfort); chest tightness; dyspnea (breathing difficulty), rales, decreased pulmonary function | Respiratory system                     | NIOSH REL<br>Dust: TWA 5 mg/m <sup>3</sup> C 15 mg/m <sup>3</sup><br>Fume: TWA 5 mg/m <sup>3</sup> ST 10 mg/m <sup>3</sup><br>OSHA PEL<br>TWA 5 mg/m <sup>3</sup> (fume) TWA 15 mg/m <sup>3</sup> (total dust)<br>TWA 5 mg/m <sup>3</sup> (resp dust) | NA                   | NA      | NA                        |
| Nitric Acid<br>CAS# 7697-37-2                              | Inhalation, ingestion, skin and/or eye contact                  | Irritation eyes, skin, mucous membrane; delayed pulmonary edema, pneumonitis, bronchitis; dental erosion                                                                                                                                                                                                  | Eyes, skin, respiratory system, teeth  | NIOSH REL<br>TWA <sub>8</sub> 2 ppm (5 mg/m <sup>3</sup> ) ST 4 ppm (10 mg/m <sup>3</sup> )                                                                                                                                                           | --                   | NA      | 11.95                     |
| PCBs<br>(Chlorodiphenyls (54% Chlorine)<br>CAS# 11097-69-1 | Inhalation, skin absorption, ingestion, skin and/or eye contact | Irritation eyes, chloracne; liver damage; reproductive effects; [potential occupational carcinogen]                                                                                                                                                                                                       | Skin, eyes, liver, reproductive system | NIOSH REL<br>TWA <sub>8</sub> 0.001 mg/m <sup>3</sup> Skin                                                                                                                                                                                            | NA                   | NA      | NA                        |
| PCBs<br>(Chlorodiphenyls (42% Chlorine)<br>CAS# 53469-21-9 | Inhalation, skin absorption, ingestion, skin and/or eye contact | Irritation eyes; chloracne; liver damage; reproductive effects; [potential occupational carcinogen]                                                                                                                                                                                                       | Skin, eyes, liver, reproductive system | NIOSH REL<br>Ca TWA <sub>8</sub> 0.001 mg/m <sup>3</sup> Skin                                                                                                                                                                                         | NA                   | NA      | NA                        |

Notes:

Table data from National Institute for Occupational Safety and Health (NIOSH) pocket guide (<https://www.cdc.gov/niosh/npg/default.html>)

ppm: parts per million

Ca: Carcinogen

eV: Electron volts  
--: Activity-specific coordination as needed  
NA: Not available  
OEL: Occupational Exposure Limit  
OSHA: Occupational Safety and Health Administration  
PEL: Permissible Exposure Limit  
REL: Recommended Exposure Limit  
ST: Short Term  
TWA: Time Weighted Average

<https://www.acgih.org/ethyl-benzene-2/>  
<https://www.acgih.org/manganese-elemental-and-inorganic-compounds/>  
<https://www.acgih.org/mercury-alkyl-compounds/>  
<https://www.acgih.org/toluene/>  
<https://www.acgih.org/xylene-all-isomers/>  
<https://www.acgih.org/pyridine/>  
<https://www.acgih.org/o-dichlorobenzene/>  
<https://www.acgih.org/p-dichlorobenzene/>  
<https://www.acgih.org/methyl-ethyl-ketone-2/>  
<https://www.acgih.org/acetone/>  
<https://www.acgih.org/aluminum-metal-and-insoluble-compounds/>  
<https://www.acgih.org/beryllium-and-compounds/>  
<https://www.acgih.org/cadmium-and-compounds/>  
<https://www.acgih.org/chlorobenzene/>  
<https://www.acgih.org/cobalt-and-inorganic-compounds/>  
<https://www.acgih.org/magnesium-oxide/>  
<https://www.acgih.org/methyl-chloride/>  
<https://www.acgih.org/tetrachloroethylene-2/>  
<https://www.acgih.org/thallium-and-compounds/>  
<https://www.acgih.org/trichloroethylene/>  
<https://www.acgih.org/vanadium-pentoxide/>

## 7 Site Control and Communications

The primary purposes for site controls are to establish the hazardous area perimeter, reduce migration of contaminants into clean areas, and prevent unauthorized access or exposure to hazardous materials by site personnel and the public. Site control is especially important in emergency situations.

### 7.1 General Site Control Safety Procedures

The following standard safe work practices apply to all Anchor QEA site personnel and subcontractors and shall be discussed in the safety briefing prior to initiating work on the site:

- Eating, drinking, chewing gum or tobacco, and smoking are prohibited on site except in designated areas.
- Hands and faces must be washed upon leaving the work area and before eating, drinking, chewing gum or tobacco, and smoking.
- A buddy system will be used. Radio, cell phone, or hand signals will be established to maintain communication.
- During site operations, each worker will consider himself/herself as a safety backup to his/her partner.
- Visual contact will be maintained between buddies on site when performing potentially hazardous duties.
- No personnel will be admitted to the site without the proper safety equipment, training, and (if required) medical monitoring certification.
- All personnel must comply with established safety procedures. Any staff member who does not comply with safety policy as established in this HASP may be subject to corrective action, potentially including but not limited to, being reprimanded or immediately dismissed.
- Proper decontamination procedures must be followed before leaving a contaminated work area.

### 7.2 Work Area Access Control

If work is performed in public areas, the following precautions shall be taken to protect both the site personnel and the public. Access control to the work area will be accomplished using a combination of the following devices and/or methods:

- Fences and/or barricades
- Traffic control devices and/or use of flaggers
- Caution tape
- Other methods to keep the site secure and provide a visual barrier to help keep unauthorized personnel from entering the site and active work areas

### 7.3 Hazardous Waste Site Work Control Procedures

To prevent contamination from migrating from personnel and equipment, work areas will be clearly specified as an Exclusion Zone/Hot Zone (EZ), Contamination Reduction Zone (CRZ), or Support Zone/Clean Zone (SZ) prior to beginning operations. Each work area will be clearly identified using signs or physical barriers. At the end of each workday, the site should be secured and/or guarded to prevent unauthorized entry.

The site work zones will be defined as follows:

- **Exclusion Zone/Hot Zone (EZ).** The EZ will be the “hot zone” or contaminated area inside the site perimeter (or sample collection area of boat). The EZ is the defined area where potential respiratory and/or health hazards exist. All personnel entering the EZ must use the required PPE, as set forth in this HASP, and meet the appropriate training and medical clearance. Entry to and exit from this zone will be made through a designated point. Appropriate warning signs to identify the EZ should be posted (e.g., DANGER, AUTHORIZED PERSONNEL ONLY, PROTECTIVE EQUIPMENT REQUIRED BEYOND THIS POINT). Personnel and equipment decontamination must be performed upon exiting the EZ.
- **Contamination Reduction Zone (CRZ).** The CRZ, also known as the “warm zone,” is a transitional zone between the EZ and the SZ (also known as the “cold zone” or “clean zone”). The CRZ provides a location for removal and decontamination of PPE and tools leaving the EZ. A separate decontamination area will be established for heavy equipment. All personnel and equipment must exit via the CRZ. If the CRZ is compromised at any time, a new CRZ will be established.
- **Support Zone/Clean Zone (SZ).** This uncontaminated zone will be the area outside the EZ and CRZ and within the geographic perimeters of the site (including boat and processing areas). The SZ is used for support personnel; staging materials; parking vehicles; office, laboratory, and sanitation facilities; and receiving deliveries. Personnel entering this zone may include delivery personnel, visitors, security guards, and others who will not necessarily be permitted in the EZ or CRZ.

A log of all personnel visiting, entering, or working on the site shall be maintained by the FL. No visitor will be allowed in the EZ without showing proof of training and medical certification, per 29 CFR 1910.120(e),(f) (and 29 CFR 1926.1101(k)(9),(m) if appropriate). Visitors will attend a site orientation given by the FL and sign the HASP.

### 7.4 Site-Specific Work Zone Requirements

This section contains guidelines for maintaining safe conditions when working from a boat, in a roadway, or at an excavation site.

#### 7.4.1.1 Safety Equipment

In addition to PPE, basic emergency and first aid equipment will also be provided. Equipment will include:

- U.S. Coast Guard (USCG)-approved personal flotation devices (PFDs) when within 10 feet of water
- First aid kit adequate for the number of personnel
- Emergency eyewash

Anchor QEA and/or subconsultants will provide this equipment, which must be at the location(s) where field activities are being performed. Equipment will be checked daily to verify its readiness for use.

#### 7.4.2 Working in a Roadway

Work conducted in public streets may require coordination with local governments and development and submittal of a traffic control plan in accordance with the U.S. Department of Transportation (DOT) Manual on Uniform Traffic Control Devices (MUTCD). Use of personnel qualified as Flaggers may also be required to provide temporary traffic control.

Observe the following site control practices and procedures when working in roadways:

- Plan and conduct work in a manner that traffic may be continuously observed. This may require having a spotter equipped with a noise-making device such as an air horn or a whistle, as appropriate.
- Wear a high-visibility traffic vest and hardhat when a vehicle hazard exists<sup>3</sup>. Include lighted elements when possible in high hazard environments.
- Use cones, flag-mounted cones, caution tape, and/or barricades.
- Protect the work area with a vehicle or piece of heavy equipment if this does not pose an additional hazard. The vehicle should have a strobe light and operating headlights or running lights (if equipped).
- Develop a traffic flow plan for high-traffic situations (as appropriate):
  - Use a flag person
  - Use a flashing arrow sign
  - Use "WORKER AHEAD" signs liberally
  - Obtain lane closing permits
  - Engage police details

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<sup>3</sup> The 2009 MUTCD (ANSI 107-2004) federal standard for High-Visibility Apparel and Headwear stipulates specific requirements for, among other characteristics, reflectivity of work vests and headwear. This standard must be reviewed and provisions included if work covered by this HASP includes work in controlled roadways.

See Sections 12.1.15 and 12.1.16 for additional information regarding motor vehicle operation and vehicular traffic.

### **7.4.3 *Working at Excavation or Trenching Sites***

Observe the following site control practices and procedures when working around excavation and trenching sites:

- A “competent person” is required per Occupational Safety and Health Act (OSHA), 29 CFR 1926.P.
- Safeguard open excavations by restricting unauthorized access.
- Highlight the work area using prominent warning signs (e.g., cones, sawhorses, or other barricades, and signage) placed a minimum of 10 feet back from the excavation opening.
- Maintain zone definition along the perimeter with a continuous string of high-visibility caution tape.

#### **7.4.3.1 Excavations Left Unattended or Overnight**

Use one of the following methods for excavations left unattended or overnight:

- Surround the entire perimeter with plastic or cloth construction net fencing. Anchor the fencing to the ground using steel posts driven into the ground. Space out posts no greater than 8 feet apart. The fence should be a minimum of 4 feet high. Fence material must be of a quality capable of withstanding a pressure of 200 pounds. Place the fencing a minimum of 10 feet back from the excavation opening.
- Place 8-foot-long barricades affixed with flashing lights end to end with 4-foot-high construction net fence attached to barricades.
- Use temporary curbing or concrete “jersey” barriers affixed with flashing signal lights or other effective warning signs.

## **7.5 Field Communications**

Communications between all Anchor QEA employees and subcontractors at the work site can be verbal and/or non-verbal. Verbal communication can be affected by the on-site background noise and various PPE. See Table 7-1 for a list of the types of communication methods and equipment to use, depending on site conditions. Communication equipment must be checked daily to verify proper operation. All project personnel must be initially briefed on the communication methods prior to starting work; communication methods should be reviewed in daily safety meetings.

**Table 7-1**  
**Field Communication Methods**

| Type of Communication                           | Communication Device | Signal                                                 |
|-------------------------------------------------|----------------------|--------------------------------------------------------|
| Emergency notification                          | Cellular Telephone   | Initiate phone call using applicable emergency numbers |
| Emergency notification among site personnel     | Cellular Telephone   | Initiate communication with Code Red message           |
| Hailing site personnel for non-emergency        | Compressed Air Horn  | One long blast, one short blast                        |
| Hailing site personnel for emergency evacuation | Compressed Air Horn  | Three long, continuous blasts                          |
| Hailing site personnel for distress, need help  | Visual               | Arms waved in circle over head                         |
| Hailing site personnel for emergency evacuation | Visual               | Arms waved in criss-cross over head                    |
| Contaminated air/strong odor                    | Visual               | Hands clutching throat                                 |
| Break, lunch, end of day                        | Visual               | Two hands together, break apart                        |



## 8 Decontamination Procedures and Practices

### 8.1 Minimization of Contamination

The following measures will be observed to prevent or minimize exposure to potentially contaminated materials:

#### **Personnel**

- Do not walk through spilled materials.
- Do not handle, touch, or smell sample media directly.
- Make sure PPE has no cuts or tears prior to use.
- Protect and cover any skin injuries.
- Stay upwind of airborne dusts and vapors.
- Do not eat, drink, chew tobacco, or smoke in the work zones.

#### **Sampling Equipment and Vehicles/Vessels**

- Use care to avoid getting sampled media on the outside of sample containers.
- If necessary, bag sample containers before filling with sampled media.
- Place clean equipment on a plastic sheet to avoid direct contact with contaminated media.
- Keep contaminated equipment and tools separate from clean equipment and tools.
- Fill sample containers over a plastic tub to contain spillage.
- Clean up spilled material immediately to avoid tracking around the vehicle/vessel.

### 8.2 Decontamination Equipment

All vehicles, vessels, and equipment that have entered potentially contaminated areas will be visually inspected and, if necessary, decontaminated prior to leaving the area. If the level of vehicle contamination is low, decontamination may be limited to rinsing tires and wheel wells with an appropriate detergent and water. If the vehicle is significantly contaminated, steam cleaning or pressure washing may be required. Tools will be cleaned in the same manner. Rinsate from all decontamination activities will be collected for proper disposal. Decontamination of equipment and tools will take place within the CRZ.

The following supplies will be available to perform decontamination activities:

- Wash and rinse buckets
- Tap water and phosphate-free detergent
- Scrub brushes
- Distilled/deionized water
- Deck pump with pressurized freshwater hose (aboard the vessel)
- Pressure washer/steam cleaner, if appropriate

- Paper towels and plastic garbage bags

### **8.3 Personnel Decontamination**

The FL will verify that all site personnel are familiar with personnel decontamination procedures as listed below. All personnel wearing PPE in a work area (EZ) must undergo decontamination prior to entering the SZ. Personnel will perform the following decontamination procedures:

- Wash and rinse outer gloves and boots in portable buckets to remove gross contamination.
- If suit is heavily soiled, rinse it off.
- Remove outer gloves; inspect and discard if damaged. Leave inner gloves on. Personnel will remove their outer garment and gloves, dispose of them, and properly label container or drum. Personnel will then decontaminate their hard hats and boots with an aqueous solution of detergent or other appropriate cleaning solution. These items then will be hand-carried to the next station. Remove inner gloves.
- Thoroughly wash hands and face before leaving CRZ.
- Sanitize respirators and place in a clean plastic bag.

### **8.4 Sampling and Processing Equipment Decontamination**

To prevent sample cross-contamination, sampling and processing equipment in contact with soil, sediment, or water samples will undergo the following decontamination procedures when work is completed in the CRZ and prior to additional use:

1. Rinse with potable water and wash with scrub brush.
2. Wash with phosphate-free detergent (Alconox).
3. Visually inspect the sampler and repeat the scrub and rinse step, if necessary. If scrubbing and rinsing with Alconox is insufficient to remove visually observable tar-related contamination on equipment, the equipment will be scrubbed and rinsed using hexane (or similar type solution) until all visual signs of contamination are absent.
4. Rinse external sampling equipment with potable water three times prior to use. Rinse homogenizing equipment once with potable water and three times with distilled water prior to and between sample processing.

### **8.5 Handling of Investigation-Derived Waste**

All remaining soil or sediment, fluids used for decontamination of sampling equipment, and sample collection disposable wastes (e.g., gloves, paper towels, foil, or others) will be placed into appropriate containers and staged on site for disposal.

### ***8.5.1 Disposable Personal Protective Equipment***

Disposable PPE may include Tyvek suits, inner latex gloves, and respirator cartridges. Dispose of PPE according to the requirements of the client and state and federal agencies.

### ***8.5.2 Non-Disposable Personal Protective Equipment***

Non-disposable PPE may include respirators and boots and gloves. When decontaminating respirators, observe the following practices and procedures:

- Wipe out the respirator with a disinfecting pad prior to donning.
- Decontaminate the respirator on site at the close of each day with an approved sanitizing solution.

When decontaminating boots and gloves, observe the following practices and procedures:

- Decontaminate the boots or gloves outside with a solution of detergent and water; rinse with water prior to leaving the site.
- Protect the boots or gloves from exposure by covering with disposable covers such as plastic to minimize required decontamination activities.

## **8.6 Sanitizing Personal Protective Equipment**

Respirators, reusable protective clothing, and other personal articles must be not only decontaminated before being reused, but also sanitized. The insides of masks and clothing become soiled due to exhalation, body oils, and perspiration. Manufacturer's instructions should be used to sanitize respirator masks. If practical, reusable protective clothing should be machine-washed after a thorough decontamination; otherwise, it must be cleaned by hand.

## **8.7 Emergency Personnel Decontamination**

Personnel with medical problems or injuries may also require decontamination. There is the possibility that the decontamination may aggravate or cause more serious health effects. If prompt lifesaving, first aid, and medical treatment are required, decontamination procedures will be omitted. In either case, a member of the site management team will accompany contaminated personnel to the medical facility to advise on matters involving decontamination.

## **8.8 Containment of Decontamination Fluids**

As necessary, spill control measures will be used to contain contaminated runoff that may enter into clean areas. Use plastic sheeting, hay bales, or install a spill control system to prevent spills and contain contaminated water.

## 9 Health and Safety Training and Informational Programs

This section describes the health and safety training and informational programs with which Anchor QEA project site personnel must comply. All certifications required in this section are provided in Appendix D and will be kept on internal file.

### 9.1 Initial Project Site Orientation

Work on all Anchor QEA project sites requires participation in an initial health and safety orientation presented by the PM or FL that will consist of, at a minimum, the following topics:

- A review of the contents of this HASP, including the Scope of Work and associated site hazards and control methods and procedures.
- Provisions of this plan are mandatory for all Anchor QEA personnel assigned to the project.
- Anchor QEA subcontractors are also expected to follow the provisions of this plan unless they have their own HASP that covers their specific activities related to this project and includes the minimum requirements of this HASP.
- All visitors to the work site will also be required to abide by the requirements of this plan.
- Personnel assigned to perform work at the project site, working under the provisions of this HASP, will be required to read the plan and must sign the Health and Safety Plan Acknowledgement Form to confirm that they understand and agree to abide by the provisions of this plan. Personnel not directly affiliated with the project (i.e., visitors) may also be required to sign the Liability Waiver.

### 9.2 Daily Safety Meetings

Daily safety meetings (“tailgate meetings”) make accident prevention a top priority for everyone and reinforce awareness of important accident-prevention techniques. The following daily safety meeting procedures and practices are required:

- Daily safety meetings will be held each morning prior to conducting site activities.
- The Daily Safety Briefing form in Appendix A will be used to document each meeting.
- Copies of the completed Daily Safety Briefing forms will be maintained on site during the course of the project.

### 9.3 End-of-Day Wellness Checks

Similar to the daily safety meetings, field staff will gather at the end of the day to verify group health and wellness and discuss any near misses that occurred that day. The wellness checks will be recorded on that day’s Daily Safety Briefing form.

## 9.4 Hazardous Waste Operations Training

Personnel working on project sites that present a potential exposure to hazardous wastes or other hazardous substances shall be trained in accordance with the requirements of the 29 CFR 1910.120 (HAZWOPER) regulation. Training requirements will consist of the following:

- Field personnel must complete a minimum of 40 hours of hazardous waste activity instruction.
- Field personnel must complete a minimum of 3 days of supervised field instruction.
- Field personnel assigned to the site will also have received 8 hours of refresher training if the time lapse since their previous training has exceeded 1 year.
- On-site managers and supervisors directly responsible for employees engaged in hazardous waste operations will receive an additional 8 hours of supervisory training.
- Field personnel shall be current in first aid/CPR training offered by the American Red Cross or equivalent.
- Other training may be required depending on the task to be performed (e.g., confined space, excavation/trenching, underground storage tank removal, fall protection, respiratory protection, and hazard communication).

## 9.5 Hazard Communication Program

The purpose of hazard communication (Employee Right-to-Know) is to verify that the hazards of all chemicals located at the field project site are communicated to all Anchor QEA personnel and subcontractors according to 29 CFR 1926.59. Refer to the Anchor QEA Hazard Communication Program document for additional information.

Every container of hazardous materials must be labeled by the manufacturer, who must also provide a SDS upon initial order of the product and upon request thereafter. The actual format may differ from company to company (e.g., National Fire Protection Association [NFPA], Hazardous Material Information System [HMIS], or other), but the labels must contain similar types of information. Maintain manufacturer labels if possible. The label may use words or symbols to communicate the following:

- Introduction
- Hazard(s) identification
- Composition/information on ingredients
- First-aid measures
- Fire-fighting measures
- Accidental release response measures
- Handling and storage
- Exposure controls/personal protection

- Physical and chemical properties
- Stability and reactivity properties
- Toxicological properties
- Ecological properties
- Disposal considerations
- Transport considerations
- Regulatory information
- Other information, including at a minimum, label preparation or last revision date

SDS for all chemicals brought onto the site or anticipated to be used on site shall be provided in Appendix C of this HASP. These SDS shall be readily available for reference by site personnel and emergency response personnel.

Hazardous materials received without proper labels shall be set aside and not distributed for use until properly labeled.

If a hazardous chemical is transferred into a portable container (approved safety can), even if for immediate use only, the contents (e.g., acetone or gasoline) of the portable container must be identified.

## 9.6 Respiratory Protection Training

Respiratory protection is not anticipated for this work. Should conditions change, work will be stopped and the DOHS will be consulted. Anchor QEA employees who use respiratory protection must be trained in accordance with Anchor QEA's RPP, as required by 29 CFR 1910.134. This training includes the following:

- Medical evaluations of employees required to use respirators
- Fit testing procedures for tight-fitting respirators
- Procedures for proper use of respirators in routine and reasonably foreseeable emergency situations
- Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding, and otherwise maintaining respirators
- Training of employees in the respiratory hazards to which they are potentially exposed during routine and emergency situations
- Training of employees in the proper use of respirators, including putting on and removing them, any limitations on their use, and their maintenance

See Section 10.2 for additional information.

## 10 General PPE Requirements

The minimum level of PPE should be selected according to the hazards that may be encountered during site activities in accordance with established U.S. Environmental Protection Agency (EPA) levels of protection (D and C). Only PPE that meets American National Standards Institute (ANSI) standards shall be worn. Site personnel must maintain proficiency in the use and care of PPE. Damaged or defective PPE must be replaced and may not be used. Anchor QEA will provide all necessary PPE for its employees as described in this HASP.

Refer to Section 5 for site-specific job task and level-of-protection requirements.

### 10.1 Minimum Requirements: Level D Protection

The minimum level of protection on project sites will be Level D protection, which consists of the following equipment:

- Standard work uniform/coveralls
- Work boots with safety toe conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05
- Approved safety glasses or goggles (meets ANSI Z87.1—2010 requirements for eye protection)
- Hard hat (meets ANSI Z89.1—1986 requirements for head protection)
- High-visibility traffic safety vest
- Hearing protection when there are high noise levels

Level D protection will be used only when:

- The atmosphere contains no known hazards
- Work functions preclude splashes, immersions, or the potential for unexpected inhalation of, or contact with, hazardous concentrations of chemicals
- Atmospheric concentrations of contaminants are less than the Permissible Exposure Limit (PEL) and/or Threshold Limit Value (TLV)

#### 10.1.1 Modified Level D Protection Requirements

Depending on the Scope of Work and the potential hazards to be encountered, Level D protection shall be modified to include additional protective equipment such as USCG-approved PFDs, face shields/goggles, chemical-resistant clothing, and disposable gloves of varying materials depending on the chemical substances involved. An upgrade to Modified Level D occurs when there is a possibility that contaminated media can contact the skin or work uniform, or if unique, site-specific hazards exist.

## 10.2 Respiratory Protection Requirements

Respiratory protection is not anticipated for this work. Should conditions change, work will be stopped and the DOHS will be consulted. Respiratory protection devices may potentially be used for protection against particulates and organic vapors during the course of an Anchor QEA field project. The need for respiratory protection will be determined by air monitoring results and site conditions, and in accordance with Anchor QEA's RPP (contact Tim Shaner with questions). However, engineering and administrative controls must first be evaluated for use as the primary controls for protection against site respiratory hazards. In the event that engineering and administrative controls are deemed not feasible, respiratory protection will be required.

The remainder of this section is provided as general reference and is meant to summarize salient points from Anchor QEA's RPP. For projects requiring respiratory protection, this section will be amended as appropriate based on project-specific respiratory hazard analysis, and all respiratory protection will take place in accordance with Anchor QEA's RPP.

### *10.2.1 Level C Protection Requirements*

An upgrade to Level C protection occurs when the results of air monitoring reveal that action levels have been exceeded. An upgrade to Level B protection occurs when the results of air monitoring reveal that action levels have been exceeded.

Level C protection, in addition to Level D equipment, involves the use of full-face and/or half-face Air-Purifying Respirators (APRs) equipped with cartridges of appropriate type for the airborne hazards and National Institute for Occupational Safety and Health (NIOSH) approved.

Level C protection shall be used in the following situations:

- When there is a recognized need for protection against particulates, organic vapors, or other airborne contaminants during the course of the project.
- During activities where product odors or exposure symptoms are noted.

If, during the use of respiratory protection, any unusual odors or other evidence of elevated concentrations of chemicals in the workers' breathing zone is noted, the work shall be stopped, workers shall exit the work area, and the PM and DOHS shall be contacted for instructions.

### *10.2.2 Cartridge Change-Out Schedule*

Cartridge change-out schedule data are subject to updates by manufacturers at any time. The data provided in this section must be verified prior to HASP finalization on a project-specific basis.

Field personnel must understand the limitations of APRs and the End-of-Service Life cartridge change-out schedule for the particular type of respirator that will be used.



**Table 10-1**

**Respirator Cartridge Change-Out Schedule**

All cartridges will be changed a minimum of once daily—or more frequently—if personnel begin to experience increased inhalation resistance. Cartridges will be changed immediately if breakthrough, a chemical warning property (e.g., eye, nose, or throat irritation or odor), or cartridge end-of-life indicator activation occurs. The FL will review this requirement after monitoring the employee's breathing zone for site contaminants and will revise this schedule as may be necessary to avoid overexposure.

### *10.2.3 Level B and A Protection Requirements*

An upgrade to Level B or Level A protection occurs when the results of air monitoring reveal that action levels have been exceeded. Anchor QEA employees are not permitted to work in atmospheres requiring Level B or Level A respiratory protection.

### *10.2.4 Respirator Fit Testing*

Respiratory protection is not anticipated for this work. Should conditions change, work will be stopped and the DOHS will be consulted. All Anchor QEA personnel who may be required to wear a negative-pressure APR in the performance of their work duties shall be fit-tested on an annual basis. Employees who wear a respirator for more than 30 days per year shall be enrolled in a medical monitoring program as detailed in Section 13 of this HASP.

Employees shall have the opportunity to handle the respirators and wear them in normal air for a familiarity period prior to fit-testing. On each occasion that employees don a respirator for work purposes, they shall test the piece-to-face seal by use of the following positive and negative pressure tests:

- **Positive Pressure Test:** With the exhaust port(s) blocked, the positive pressure of slight exhalation should remain consistent for several seconds.
- **Negative Pressure Test:** With the intake ports blocked, the negative pressure of slight inhalation should remain constant for several seconds.

APRs shall not be worn when conditions prevent a seal of the respirator to the wearer. Such conditions may be the growth of a beard, sideburns, a skull cap that projects under the face piece, or temple pieces on glasses. No employee may wear a beard if it interferes with the fit of the respirator. Also, the absence of one or both dentures can seriously affect the fit of a face-piece, and should be worn at all times that respirators are being used.

### *10.2.5 Respirator Cleaning, Maintenance, and Inspection*

All respirators used on site shall be cleaned and maintained in the following manner:

- Remove filters and cartridges.
- Visually inspect face piece and parts, and discard faulty items.
- Remove all elastic headbands.
- Remove exhalation cover and inhalation valves.
- Wash, sanitize, and rinse face piece. Wash any parts that were removed separately.
- Dry the mask. Wipe face pieces and valves.
- Disassemble and clean the exhalation valve.
- Visually inspect face piece and all parts for deterioration, distortion, or other faults that might affect the performance of the respirator.
- Replace any questionable or faulty parts.
- Reassemble mask and visually inspect completed assembly.
- Seal mask in plastic bag.

## 11 General Air Monitoring Requirements

### 11.1 General Requirements

In general, air monitoring shall be conducted when the possibility of hazardous atmospheres, chemical volatilization, or contaminated airborne dust exists (e.g., from intrusive activities involving contaminated soils or groundwater, developing new monitoring wells, working with wells containing known COCs, confined space entry, or others).

Air movers or other engineering controls shall be used to exhaust or dilute solvent vapors emanating from monitoring wells or hazardous atmospheres in confined spaces prior to the use of respiratory protection devices.

Site-specific air monitoring action levels are provided in Section 5.2.

### 11.2 Real-Time Air Monitoring Equipment

As applicable, organic vapor concentrations shall be monitored in the field with either a photoionization detector (PID) or flame ionization detector (FID). Flammable vapors and/or gasses are monitored with an oxygen/lower-explosive limit (O<sub>2</sub>/LEL) real-time instrument. Organic vapor measurements are usually taken in the breathing zone of the worker while O<sub>2</sub>/LEL measurements are taken at the point of operation (e.g., monitoring well head or auger point).

As applicable, airborne dust/particulate concentrations shall be measured using a real-time aerosol monitor (using a scattered light photometric sensing cell) when there are visible signs of potentially contaminated airborne dust. Both area and personal air monitoring readings are to be taken to characterize site activities.

As applicable, colorimetric detector tubes shall be used to monitor specific COCs such as benzene or vinyl chloride if there is a possibility that they may be present in elevated concentrations based upon the background of the project site, the Scope of Work, and conditions discovered at the site.

As applicable, other real-time air monitoring equipment, such as hydrogen cyanide meters, may be utilized depending upon the Scope of Work and COCs.

Air monitoring results shall be documented on the Daily Air Monitoring Record form (see Appendix A) or in the field logbook.

### 11.3 Time-Integrated Air Monitoring Equipment

Some Anchor QEA projects may require the use of time-integrated air monitoring equipment to determine employee exposures to COCs. Time-integrated air monitoring would be required if there is the possibility that employees would be exposed to concentrations of a COC that approach or

exceed an established exposure limit. Typical time-integrated sampling methods will usually involve the use of personal sampling pumps and associated filter and/or charcoal sampling media, or the use of diffusion-based sampling media. Exposed sampling media are normally sent to an accredited laboratory for analysis. Contact the DOHS for consultation and assistance with the performance of time-integrated air monitoring activities.

## **11.4 Equipment Calibration and Maintenance**

Calibration and maintenance of air monitoring equipment shall follow manufacturer specifications and must be documented. Recalibration and adjustment of air monitoring equipment shall be completed as site conditions and equipment operation warrant. Record all air monitoring equipment calibration and adjustment information on the Daily Air Monitoring Record form (see Appendix A) and in the field logbook.

## **11.5 Air Monitoring Action Levels**

Air monitoring action levels have been developed that stipulate the chemical concentrations in the breathing zone that require an upgrade in level of PPE.

Air monitoring action levels are typically set at one-half of the OSHA PEL, NIOSH Recommended Exposure Limit (REL), or the American Conference of Governmental Industrial Hygienists (ACGIH) TLVs. The rationale for establishing action levels is based on the available data that characterize COCs in site media.

Air monitoring measurements shall generally be taken in the breathing zone of the worker most likely to have the highest exposure. Transient peaks will not automatically trigger action. Action will be taken when levels are consistently exceeded in a 2-minute period. Similarly, if chemical odors are detected that are a nuisance, bothersome, or irritating, an upgrade in respiratory protection can provide an extra level of comfort or protection when conducting site activities.

## **11.6 Air Monitoring Frequency Guidelines**

In general, conduct periodic air monitoring when:

- It is possible that an immediately dangerous to life or health (IDLH) condition or a flammable atmosphere has developed (e.g., confined space entry or intrusive activities).
- There is an indication that exposures may have risen over established action levels, PELs, or published exposure levels since the last monitoring. Look for a possible rise in exposures associated with the following situations:
  - Change in site area (e.g., work begins on a different section of the site).
  - Change in on-site activity (e.g., one operation ends and another begins).
  - Change in contaminants (e.g., handling contaminants other than those first identified).

- Visible signs of particulate exposure from intrusive activities such as drilling, boring, or excavation.
- Perceptible chemical odors or symptoms of exposure.
- Handling leaking drums or containers.
- Working with obvious liquid contamination (e.g., a spill or lagoon).
- When the possibility of volatilization exists (such as with a new monitoring well or a well containing known COCs).

## 12 Health and Safety Procedures and Practices

In addition to the task-specific JSAs listed in Section 6.1 and presented in Appendix B, this section lists the health and safety procedures and practices applicable to this project. For additional information, consult with the PM.

### 12.1 Physical Hazards and Controls

#### 12.1.1 General Site Activities

Observe the following general procedures and practices to prevent physical hazards:

- Legible and understandable precautionary labels shall be affixed prominently to containers of potentially contaminated soil, sediment, water, and clothing.
- No food or beverages shall be present or consumed in areas that have the potential to contain COCs and/or contaminated materials or equipment.
- No tobacco products or cosmetics shall be present or used in areas that have the potential to contain COCs and/or contaminated materials or equipment.
- An emergency eyewash unit shall be located immediately adjacent to employees who handle hazardous or corrosive materials, including decontamination fluids. All operations involving the potential for eye injury or splash must have approved eyewash units locally available capable of delivering at least 0.4 gallons per minute for at least 15 minutes.
- Personnel working within 10 feet of bodies of water shall wear USCG-approved PFDs.
- Certain project sites may have newly finished work (e.g., concrete, paving, framing, habitat reconstruction, or sediment caps) that may be damaged by unnecessary contact, or that could cause dangerous conditions for personnel (e.g., slipping, sinking, or tripping). Personnel working in or around these areas shall communicate with the PM, FL, and client contact as needed to prevent damaging new work or entering dangerous conditions.
- Generally, all on-site activities will be conducted during daylight hours. If work after dusk is planned or becomes necessary due to an emergency, adequate lighting must be provided.
- Hazardous work, such as handling hazardous materials and heavy loads and operating equipment, should not be conducted during severe storms.
- All temporary electrical power must have a ground-fault circuit interrupter (GFCI) as part of its circuit if the circuit is not part of permanent wiring. All equipment must be suitable and approved for the class of hazard present.

#### 12.1.2 Slips, Trips, and Falls

Observe the following procedures and practices to prevent slips, trips, and falls:

- Inspect each work area for slip, trip, and fall potential prior to each work task.

- Slip, trip, and fall hazards identified must be communicated to all personnel. Hazards identified shall be corrected or labeled with warning signs to be avoided.
- All personnel must be aware of their surroundings and maintain constant communication with each other at all times.

### *12.1.3 Ergonomic Considerations*

Certain field tasks may involve workers in fixed positions (e.g., observing subcontractor work) or performing repetitive motions over a period of time (e.g., sediment sample processing). It is important that workers self-monitor for ergonomic fatigue (e.g., soreness, tightness, stiffness, or pain in muscles) and make adjustments to work tasks, body positions, or work areas so that ergonomic stressors are minimized. Suggestions for decreasing the likelihood of ergonomic stress include the following:

- Limit fixed positions. Periodically vary standing and sitting positions, take frequent short walks, and modify observation locations when possible.
- Minimize extreme postures. Conduct work tasks using comfortable postures (particularly if the tasks are repetitive), and use tools or structures to minimize the need to hold or work with materials or access the work area.
- Limit contact stress. Be aware of soft tissue resting on hard surfaces, and limit these occurrences (e.g., use comfortable footwear, and use tools to hold materials).
- Contact the Field Mobilization Team in advance for prolonged field efforts that involve a field trailer. This group can set up field staff with a monitor, mouse, and keyboard so they are not working solely on laptops.
- Take breaks from work tasks, particularly repetitive ones.
- Consider performing stretching exercises before and during work activities, if those tasks are anticipated to be long in duration and/or strenuous.

### *12.1.4 Corrosive Material Handling Procedures*

Corrosive materials include acids and bases. They are extremely corrosive materials with a variety of uses. Acids include hydrochloric, nitric, and sulfuric acids. Bases include sodium hydroxide. Observe the following procedures when working with corrosive materials:

- Wear gloves and eye-splash protection while using acid dispensed from a small dropper bottle during water sampling.
- Wear a full-face APR equipped with combination cartridges (organic vapor/acid gas) as well as Tyvek coveralls and nitrile gloves for large volume applications.
- Have an eyewash bottle and/or portable eyewash station on site.
- Do not add anything into a virgin chemical drum, including unused product.

- Avoid mixing strong acids and bases. Consult the DOHS for task-specific evaluation. If mixing is absolutely necessary, do it slowly. Avoid vapors or fumes that are generated.
- When diluting acids and bases, add the acid or base to water in small quantities and mix cautiously.

### 12.1.5 *Electric Safety*

Observe the following procedures and practices to prevent electric shock:

- General
- Use only appropriately trained and certified electricians to perform tasks related to electrical equipment. A good rule of thumb is to defer any task that would not normally and reasonably be completed by the average public consumer.
- Each circuit encountered will be considered live until proven otherwise.
- Only proper tools will be used to test circuits.
- No wire will be touched until the circuit is determined to be de-energized.
- Extension Cords
- All extension cords used on any project will be three-pronged.
- All extension cords will be in good working order.
- Each extension cord ground will be tested for continuity on at least a quarterly basis and marked to indicate when the inspection occurred.
- Each extension cord will be visually inspected before each use.
- If any extension cord is found in disrepair or fails the continuity test, it will be taken out of service.
- Any extension cord that does not have the grounding pin will be taken out of service and not used.
- Extension cords will not be used in place of fixed wiring.
- Extension cords will not be run through holes in walls, ceilings, or floors.
- Extension cords will not be attached to the surface of any building.
- No extension cord will be of the "flat wire" type. Every extension cord will have each individual wire insulated and further protected by an outside cover.
- Be sure to locate extension cords out of traffic areas or, if this is unavoidable, flag cords and protect workers from tripping over them (i.e., use barricades and tape the cord down).
- Do not stage extension cords or powered equipment in wet areas, to the degree possible. Elevate cords, connections, and equipment out of puddles.
- Power Tools/Plug and Cord Sets
- Any cord that is cut in a way that exposes insulation will be removed from service.
- All tools and plug and cord sets will be tested for continuity.
- If grounding pins are missing, the plug and cord will be removed from service.
- Any tool or plug and cord set failing the continuity test will be removed from service.



- All power tools will have three-pronged plugs unless double insulated.
- Ground-fault Circuit Interrupters
- Each 120-volt electrical wall receptacle providing power to the job site will be protected by a portable GFCI.
- Each GFCI will be tested quarterly and marked to indicate when the inspection occurred.
- Each 120-volt, single-phase, 15- and 20-ampere receptacle outlet, including those on generators, will have an approved GFCI.
- GFCIs will be located in line as close to the piece of equipment as possible.
- Specific
- If unsure if a task requires specific electrical training, err on the side of caution and contact the PM and FL prior to proceeding.
- If subsurface work is to be performed, follow the guidelines in Section 12.1.6 and conduct utility locating prior to work and in accordance with local ordinances.
- If lock out/tag out (LO/TO) procedures are required (i.e., de-energizing machinery or equipment so work may be performed), the equipment owner must provide LO/TO procedures and training. By default, the equipment owner should perform any LO/TO. If it becomes necessary for Anchor QEA personnel to perform LO/TO tasks, contact the PM and FL prior to doing so.
- Maintain appropriate distance from overhead utilities (see Table 12-1).
- If unexpected electrical equipment is encountered (i.e., buried wire) assume it is live, stop work, and contact the PM and FL immediately.
- If working in enclosed or restricted areas where electrical hazards may be present, contact a licensed electrician or other suitably trained party to provide barriers, shields, or insulating materials to prevent electric shock.
- If working in areas where electrical hazards are present, verify that conductive clothing and jewelry is replaced with non-conductive clothing, or removed.

### *12.1.6 General Falls and Ladder Usage*

Observe the following general falls and ladder usage procedures and practices:

- Assess work areas for fall hazards. A fall protection system that meets OSHA and ANSI Z359.1 standards must be used if work is conducted 6 feet or more above the surface.
- Use ANSI Type 1A rated ladders.
- Verify that ladders are placed so their rungs, cleats, and steps are parallel, level, and uniformly spaced prior to use.
- Make sure ladder rungs are sturdy and free of cracks.
- Use ladders with secure safety feet.
- Pitch ladders at a 1 horizontal to 4 vertical (1H:4V) ratio.
- Secure ladders at the top or have another person at the bottom to help stabilize it.

- Ladders used to access an upper landing surface shall extend at least 3 feet above the upper landing surface.
- Use non-conductive ladders near electrical wires.
- The top rung of a ladder should not be used as a step.
- Do not carry any object or load that could cause a loss of balance or a fall.
- If a ladder is defective, damaged, or in disrepair (i.e., broken or missing rungs, cleats, or steps; broken or split rails; corroded components; or other faulty or defective components), tag the ladder "Do Not Use" and remove it from service until repaired.

### *12.1.7 Underground or Overhead Utility Line Contact Prevention*

Observe the following underground/overhead utility line contact prevention procedures and practices:

- Prior to conducting work, the PM or FL shall verify that all existing underground or overhead utilities in the work area were located per the state or local mark-out methods and subcontract. Documentation of utility mark-out shall be completed using the Utility Contact Prevention Checklist form (see Appendix A). No excavation work is to be performed until all utility mark-outs have been verified.
- The PM or FL shall conduct a site survey to search for signs of other buried or overhead utilities. The results of such surveys shall be documented on the Utility Mark-out documentation form.
- The property owner or facility operator shall be consulted on the issue of underground utilities. As-built drawings shall be reviewed, when available, to verify that underground utility locations are consistent with the utility location mark-outs. All knowledge of past and present utilities must be evaluated prior to conducting work.
- If on-site subsurface utility locations are in question, a private locating service shall be contacted to verify locations. If the investigation calls for boreholes in an area not covered by the municipal One-Call system, then a private utility locate firm shall be contacted to determine the location of other underground utilities.
- The PM shall have documented verbal contact and an agreement with the fiber optic company for all work within 50 feet of any fiber optic cables.
- Only non-destructive excavation, such as hand digging or hydro excavation, is permitted within 3 feet of underground high voltage, product, or gas lines. Once the line is exposed, heavy equipment can be used, but must remain at least 3 feet from the exposed line.
- Elevated superstructures (e.g., drill rig, backhoe, scaffolding, ladders, and cranes) shall remain 10 feet away from utility lines and 20 feet away from power lines. Distance from utility lines may be adjusted by the FL depending on actual voltage of the lines.
- Overhead utility locations shall be marked with warning tape or flags where equipment has the potential for contacting overhead utilities.

Table 12-1 shows the minimum clearances required for energized overhead electrical lines.

**Table 12-1**  
**Overhead Utility Clearance Requirements**

| Minimum Clearance from Energized Overhead Electric Lines |                            |
|----------------------------------------------------------|----------------------------|
| Nominal System Voltage                                   | Minimum Required Clearance |
| 0 to 50 kV                                               | 10 feet                    |
| 51 to 100 kV                                             | 12 feet                    |
| 101 to 200 kV                                            | 15 feet                    |
| 201 to 300 kV                                            | 20 feet                    |
| 301 to 500 kV                                            | 25 feet                    |
| 501 to 750 kV                                            | 35 feet                    |
| 751 to 1,000 kV                                          | 45 feet                    |

Note:

Whenever equipment operations must be performed closer than 20 feet from overhead power lines, the FL must be notified. When clearance to proceed is received from the FL, the electric utility company must be contacted to turn off the power or physically insulate (protect) the lines if the operation must be performed closer to the power line than is allowed in this table. For voltages not listed in this table, add 0.4 inch per kilovolt (kV) to obtain the safe distance between equipment and power lines.

### 12.1.8 Heavy Equipment Operations

Observe the following heavy equipment operations procedures and practices:

- Wear leather gloves while attaching support members to protect against pinching injuries.
- While working from elevated levels greater than 6 feet, verify that all employees have fall protection that meets OSHA and ANSI Z3591 standards.
- Do not stand under loads that are being raised or lowered with cranes or aerial lifts.
- The subcontractor or Anchor QEA equipment operator must conduct pre-operational inspections of all equipment. In addition, daily inspections will be conducted on the equipment prior to site activities.
- Maintain the appropriate distance from overhead utilities (see Table 12-1):
- Always stay out of the swing radius of all heavy equipment. Always use a spotter during movement of equipment. The spotter and others, as appropriate, shall maintain constant communication with the operator.
- All operators must have adequate training and be qualified to operate the particular heavy equipment unit.
- Conduct a site evaluation to determine proper positioning for the unit. Make sure the surface is level. Cordon off holes, drop-offs, bumps, or weak ground surfaces.
- When using a crane, do not use hands when the load is being lifted or lowered. Use non-conductive tag line to help direct and position the load.

- Never climb a raised platform or stand on the mid-rail or top-rail.
- Tools should always be hung or put into a belt whenever possible

### *12.1.9 Hand and Power Tools*

Observe the following procedures and practices when working with hand and power tools:

- Keep hand tools sharp, clean, oiled, dressed, and not abused.
- Worn tools are dangerous. For example, the “teeth” in a pipe wrench can slip if worn smooth, an adjustable wrench will slip if the jaws are sprung, and hammerheads can fly off loose handles.
- Tools subject to impact (e.g., chisels, star drills, and caulking irons) tend to “mushroom.” Keep them dressed to avoid flying spalls, and use tool holders.
- Do not force tools beyond their capacity.
- Flying objects can result from operating almost any power tool, so always warn people in the vicinity and use proper eye protection.
- Each power tool should be examined before use for damaged parts, loose fittings, and frayed or cut electric cords. Tag and return defective tools for repairs. Verify that there is adequate lighting, inspect tools for proper lubrication, and relocate tools or material that could “vibrate into trouble.”
- Compressed air must be shut off or the electric cord unplugged before making tool adjustments. Air must be “bled down” before replacement or disconnection.
- Proper guards or shields must be installed on all power tools before issue. Do not use improper tools or tools without guards in place.
- Replace all guards before startup. Remove cranks, keys, or wrenches used in service work.

### *12.1.10 Motor Vehicle Operation*

All drivers are required to have a valid driver’s license, and all vehicles must have appropriate state vehicle registration and inspection stickers. **Anchor QEA prohibits the use of hand-held wireless devices while driving any vehicle for business use at any time, for personal use during business hours, and as defined by law.** Additionally, site-specific motor vehicle requirements must be followed, if any.

When driving to, from, and within the job site, be aware of potential hazards including:

- Vehicle accidents
- Distractions
- Fatigue
- Weather and road conditions

To mitigate these hazards, observe the following procedures and practices regarding motor vehicle operation:

- Before leaving, inspect fuel and fluid levels and air pressure in tires, and adjust mirrors and seat positions appropriately.
- Wear a seat belt at all times and make sure that clothing will not interfere with driving.
- Plan your travel route and check maps for directions or discuss with colleagues.
- Clean windows and mirrors as needed throughout the trip.
- Wear sunglasses as needed.
- Fill up when the fuel level is low (not near empty).
- Follow a vehicle maintenance schedule to reduce the possibility of a breakdown while driving.
- Stop driving the vehicle, regardless of the speed (e.g., even 5 miles per hour) or location (e.g., a private road), when the potential of being distracted by conversation exists.
- Using hand-held communication devices (e.g., cell phones) while operating any motor vehicle is prohibited.
- Get adequate rest prior to driving.
- Periodically change your seat position, stretch, open the window, or turn on the radio to stay alert.
- Pull over and rest if you are experiencing drowsiness.
- Check road and weather conditions prior to driving.
- Be prepared to adjust your driving plans if conditions change.
- Travel in daylight hours, if possible.
- Give yourself plenty of time to allow for slowdowns due to construction, accidents, or other unforeseen circumstances.
- Use lights at night and lights and wipers during inclement weather.

### *12.1.11 Vehicular Traffic*

Observe the following procedures and practices regarding vehicular traffic:

- Wear a high-visibility traffic safety vest when vehicle hazards exist.
- Use cones, flags, barricades, and caution tape to define the work area.
- Use a vehicle to block the work area (if conditions allow).
- Engage a police detail for high-traffic situations.
- Always use a spotter in tight or congested areas for material deliveries.
- As necessary, develop traffic control plans and train personnel as flaggers in accordance with the DOT MUTCD and/or local requirements.

See Section 7.4.2 for additional information regarding work in roadways.

## *12.1.12 Working Over or Near Water*

### **12.1.12.1 Personal Flotation Devices**

PFDs are not required where employees are continuously protected from the hazard of drowning by railings, nets, safety belts, or other applicable provisions.

Type I, II, III or V USCG-approved, high-visibility PFD shall be provided and properly worn by all personnel in the following circumstances:

- On or within 10 feet of water
- On floating pipelines, pontoons, rafts, or stages
- On structures extending over or next to the water, except where guard rails or safety nets are provided for employees
- Working alone at night where there are drowning hazards, regardless of other safeguards provided
- In skiffs, small boats, or launches, unless in an enclosed cabin or cockpit
- Whenever there is a drowning hazard

The following precautions shall be followed when using PFDs:

- Prior to and after each use, the buoyant work vests or life preservers shall be inspected for defects that would alter their strength or buoyancy. Defective devices or devices with less than 13 pounds buoyancy shall be removed from service.
- All PFDs shall be equipped with reflective tape as specified in 46 CFR 25.25-15.
- Thirty-inch USCG-approved ring buoys with at least 150 feet of 600-pound capacity line shall be provided and readily available for emergency rescue operations. The distance between ring buoys shall not exceed 200 feet.
- PFD lights conforming to 46 CFR 161.012 shall be required whenever there is a potential need for life rings to be used after dark. Onshore installations, at least one life ring, and every third one thereafter, shall have a PFD light attached. PFD lights on life rings are required only in locations where adequate general lighting (e.g., floodlights or light stanchions) is not provided.

### **12.1.12.2 Cold Water Work**

When the combined air and water temperature is below 90°F, field personnel working on or near water shall wear either a float coat and bib overalls (e.g., a full two-piece "Mustang" survival suit or similar) or a one-piece survival suit. Suits or float coats shall be USCG approved. If extremely cold or severe weather conditions are forecast, work activities should be postponed. Work activities will be continually reviewed and adjustments made if wearing a survival suit during work activities potentially poses a hazard due to warm air temperatures, or limited mobility or agility. In addition,

proximity of water work to shore and scope/duration/timing of work activities will be considered when stipulating the above requirement. Overall, if water craft will be used during work, or work will be conducted near water, it is imperative that site-specific conditions are considered and evaluated so that proper safeguards and procedures are in place prior to beginning work.

In addition to considering the use of apparel appropriate for anticipated air, weather, and water conditions, field teams shall identify any procedures necessary for cold-water “man-overboard” scenarios. These procedures should be identified in the site-specific HASP, described in the JSA used for boating activities and, if prudent, practiced before work.

#### **12.1.12.3 Work Near Dams**

Work near dams should be avoided unless necessary to complete the required work scope. In the event that working near dams is required, the following shall be considered:

- Obtain safety procedures from the dam owner/operator prior to beginning work.
- Follow required safety procedures including no boating offsets and fall protection procedures.
- Obtain dam operation (i.e., spillway use and trash rack locations) schedules and plan work activities to the extent practicable during periods of no or low dam activity.

#### **12.1.13 Noise**

Excessive noise is hazardous not only because of its potential to damage hearing, but also because of its potential to disrupt communications and instructions. The following procedures and practices shall be followed to prevent noise-related hazards:

- All employees will have access to ear protection with a Noise Reduction Rating of not less than 30.
- Ear protection must be worn in any environment where site personnel must raise their voices to be heard while standing at a distance of 3 feet or less.
- Ear protection must be worn by any personnel observing or operating concrete cutting or sawing equipment, pile driving, or other loud noise-generating activities.

Hearing protection is required for site personnel operating or working near noisy equipment or operations, where the noise level is greater than 85 A-weighted decibels (dBA) (time-weighted average [TWA]), as well as personnel working around heavy equipment. The FL will determine the need and appropriate testing procedures, (i.e., sound level meter and/or dosimeter) for noise measurement.

When needed, a sound level meter will be used to measure noise levels at selected locations in the work area and on the site perimeter. When used, noise monitoring equipment must be calibrated before and after each shift.

If continuous noise levels are found to exceed 85 dBA at any location within the work area, warning signs will be posted. Site personnel and visitors will be notified that hearing protection is required. Appropriate hearing protection (i.e., ear plugs or ear muffs) will be worn whenever personnel or visitors are working in that location. A supply of ear plugs will be maintained on site.

Action levels in Table 12-3 will trigger the use of appropriate hearing protection (plugs or muffs). Hearing protection must be able to attenuate noise below 90 dBA (8-hour TWA). Each hearing protection or device has a Noise Reduction Rating (NRR) assigned by EPA. The calculation for a hearing protection device's effectiveness is as follows:

**Equation 1**

$$\text{Noise reading } dBA - (NRR - 7dB) < 90dBA$$

where:

$dB$  = decibel

$dBA$  = A-weighted decibel

NRR = Noise Reduction Rating

**Table 12-3**  
**Noise Exposure Action Levels**

| Instrument                                             | Measurement         | Action                                                                                                      |
|--------------------------------------------------------|---------------------|-------------------------------------------------------------------------------------------------------------|
| Type I or Type II<br>Sound Level Meter<br>or Dosimeter | > 80 dBA to 85 dBA  | Hearing protection recommended. Limit work duration to 8-hour shifts.                                       |
|                                                        | > 85 dBA to 90 dBA  | Hearing protection required. Limit work duration to 8-hour shifts.                                          |
|                                                        | > 90 dBA to 115 dBA | Hearing protection required. Investigate use of engineering controls. Limit work duration to 8-hour shifts. |
|                                                        | > 115 dBA           | Stop work. Consult DOHS.                                                                                    |

### 12.1.14 Lifting and Material Handling

Observe the following procedures and practices for lifting and material handling:

- Use leather gloves when handling metal, wire rope, sharp debris, or transporting materials (e.g., wood, piping, or drums).
- The size, shape, and weight of the object to be lifted must first be considered. No individual employee is permitted to lift any object that weighs more than 60 pounds. Multiple employees or mechanical lifting devices are required for objects heavier than the 60-pound limit.



- Plan a lift before doing it. Bend at the knees and lift with the legs; maintain the natural curves of the back; do not use back muscles.
- Check the planned route for clearance.
- Use the buddy system when lifting heavy or awkward objects.
- Do not twist your body while lifting.
- Know the capacity of any handling device (e.g., crane, forklift, chain fall, or come-along) that you intend to use.
- Use tag lines to control loads.
- Verify that your body, material, tools, and equipment are safe from such unexpected movement as falling, slipping, rolling, tripping, bowing, or any other uncontrolled motion.
- Trucks (i.e., flat beds) hauling equipment or materials must not be moved once rigging has been released.
- Chock all material and equipment (such as pipe, drums, tanks, reels, trailers, and wagons) as necessary to prevent rolling.
- Tie down all light, large-surface-area material that might be moved by the wind.
- When working at heights, secure tools, equipment, and wrenches against falling.
- Do not store materials or tools on ducts, lighting fixtures, beam flanges, hung ceilings, or similar elevated locations.
- Fuel-powered tools used inside buildings or enclosures shall be vented and checked for excessive noise.

### *12.1.15 Fire Control*

Observe the following fire control procedures and practices:

- Smoke only in designated areas.
- Keep flammable liquids in closed containers.
- Keep the work site clean; avoid accumulating combustible debris such as paper.
- Obtain and follow property owner hot work safety procedures when welding or performing other activities requiring an open flame.
- Isolate flammable and combustible materials from ignition sources.
- Verify fire safety integrity of equipment installations according to National Electrical Code (NEC) specifications.

### *12.1.16 Static Electricity and Transfer of Flammable Liquids*

Observe the following procedures and practices regarding static electricity when transferring flammable liquids:

- Electrically bond and ground pumps, transfer vessels, tanks, drums, bailers, and probes when moving flammable liquids.

- Electrically bond and ground vacuum trucks and the tanks they are emptying.
- Do not splash fill containers with flammable liquids.
- Pour flammable liquids slowly and carefully.
- Two fire extinguishers (2A20:BC) must be available, charged, inspected, and readily accessible.

### *12.1.17 Cleaning Equipment*

Observe the following procedures and practices when cleaning equipment:

- Wear appropriate PPE to avoid skin and eye contact with isopropyl alcohol, Alconox, or other cleaning materials.
- Stand upwind to minimize any potential inhalation exposure.
- Dispose of spent cleaning solutions and rinses accordingly.

## **12.2 Environmental Hazards and Controls**

### *12.2.1 Fatigue Management*

Because Anchor QEA personnel may be working during both daytime and nighttime hours several days per week, depending on the activity, it is important that all personnel are aware of the hazards related to fatigue. Fatigue can be defined as an increasing difficulty in performing physical or mental activities. Signs of fatigue may include tiredness, changes in behavior, loss of energy, and reduced ability to concentrate. Fatigued site personnel may have a reduced ability to recognize or avoid risks on the work site, which may lead to an increase in the number and severity of injuries and other incidents. Fatigue can occur at any time when working and may cause safety concerns due to decreased manual dexterity, reaction time, and alertness.

Fatigue results from insufficient rest and sleep between activities. Contributing factors to fatigue may include the following:

- The time of day that work takes place
- The length of time spent at work and in work-related duties
- The type and duration of a work task and the environment (e.g., weather conditions and ambient noise) in which it is performed
- The quantity and quality of rest obtained prior to, during, and after a work period
- Non-work activities
- Individual factors such as sleeping disorders, medications, or emotional state

Personnel suffering from fatigue may exhibit both physical and mental effects, such as the following:

- Slower movements
- Poor coordination

- Slower response time to interaction
- Bloodshot eyes
- Slumped or weary appearance
- Nodding off
- Distractedness or poor concentration
- Inability to complete tasks
- Fixed gaze
- Appearing depressed, irritable, frustrated, or disinterested

Employees are strongly encouraged to get sufficient pre-work rest, maintain sufficient nutritional intake during work (i.e., eat and drink at regular intervals), and communicate with team members and leaders if their level of fatigue elevates.

Use the following procedures to help detect and address fatigue-related issues:

- Periodically observe and query coworkers for signs or symptoms of fatigue.
- Site personnel that express concern over their level of fatigue, or that are observed to be fatigued such that elevated worker risk is evident, will be relieved or have their work tasks adjusted so that they may rest sufficiently.
- Work schedules will consider fatigue factors and optimize continuous periods available for uninterrupted sleep. The employee is responsible for reporting to work properly rested and fit for duty. In case of an emergency or operational difficulties (e.g., limited access due to water levels or boat repairs), work hours may require adjustment.
- Maintain a routine exercise program and regular sleep schedule as much as possible over the course of the work.
- Avoid heavy meals or caffeine and minimize or eliminate the consumption of alcohol and nicotine before sleeping.

### 12.2.2 *Heat Stress*

Observe the following general procedures and practices regarding heat stress:

- Increase the number of rest breaks and/or rotate site personnel in shorter work shifts.
- Watch for signs and symptoms of heat stress and fatigue (see Section 12.2.2.1).
- During hot months, plan work for early morning or evening.
- Use ice vests when necessary.
- Rest in cool, dry areas.
- Verify that employees have access to potable drinking water and shade.
- During conditions exceeding 95°F, verify that the following additional procedures are adhered to:
- Establish effective communication by voice, observation, or electronic means.

- Observe employees for alertness and signs or symptoms of heat illness.
- Designate one or more employees on each work site as authorized to call for emergency medical services.
- Remind employees to drink water throughout the shift.
- Conduct pre-shift meetings before beginning work to review the high heat procedures, encourage drinking water, and remind employees of their right to take a cool-down rest when necessary.

#### 12.2.2.1 Signs, Symptoms, and Treatment

The FL will be trained in heat stress prevention, including the following, prior to supervising employees:

- Procedures to prevent heat illness.
- Procedures to follow when an employee exhibits symptoms consistent with possible heat illness, including emergency response procedures.

The information provided below addresses these training requirements.

Adverse climatic conditions are important considerations in planning and conducting site operations. High ambient temperature can result in health effects ranging from transient heat fatigue, physical discomfort, reduced efficiency, personal illness, and increased accident probability to serious illness or death. Heat stress is of particular concern when chemical protective garments are worn because they prevent evaporative body cooling. Wearing PPE places employees at considerable risk of developing heat stress.

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably one of the most common (and potentially serious) illnesses, regular monitoring and other preventive precautions are vital.

**Heat Rash.** Heat rash can be caused by continuous exposure to hot and humid air and skin abrasion from sweat-soaked clothing, rubber boots, or impermeable waders. The condition is characterized by a localized red skin rash and reduced sweating. Heat rash reduces the ability to tolerate heat. To treat, keep skin hygienically clean and allow it to dry thoroughly after using chemical protective clothing. Take measures to prevent heat rash by changing clothes often to maximize use of dry garments, or taking frequent breaks to allow doffing of equipment and drying of skin.

**Heat Cramps.** Heat cramps are caused by profuse perspiration with inadequate electrolytic fluid replacement. This often robs the larger muscle groups (stomach and quadriceps) of blood, which can cause painful muscle spasms and pain in the extremities and abdomen. To treat, move the employee to a cool place and give sips of water or an electrolytic drink. Watch for signs of heat exhaustion or heat stroke.

**Heat Exhaustion.** Heat exhaustion is a mild form of shock caused by increased stress on various organs to meet increased demand to cool the body. Onset is gradual and symptoms should subside within 1 hour. Symptoms include a weak pulse; shallow breathing; pale, cool, moist skin; profuse sweating; dizziness; and fatigue. To treat, move the employee to a cool place and remove as much clothing as possible. Give sips of water or electrolytic solution and fan the person continuously to remove heat by convection. Do not allow the affected person to become chilled. Treat for shock if necessary.

**Heat Stroke.** Heat stroke is the most severe form of heat stress; the body must be cooled immediately to prevent severe injury and/or death. ***This is a medical emergency!*** Symptoms include red, hot, dry skin; a body temperature of 105°F or higher; no perspiration; nausea; dizziness and confusion; and a strong, rapid pulse. Because heat stroke is a true medical emergency, transport the individual to a medical facility immediately. Prior to transport, remove as much clothing as possible and wrap the individual in a sheet soaked with water. Fan the individual vigorously while transporting to help reduce body temperature. If available, apply cold packs under the arms, around the neck, or any other place where they can cool large surface blood vessels. If transportation to a medical facility is delayed, reduce body temperature by immersing the individual in a cool-water bath (however, be careful not to over-chill the individual once body temperature is reduced below 102°F). If this is not possible, keep the individual wrapped in a sheet and continuously douse with water and fan.

#### 12.2.2.2 Prevention

The implementation of preventative measures is the most effective way to limit the effects of heat-related illnesses. During periods of high heat, adequate liquids must be provided to replace lost body fluids. Replacement fluids can be a 0.1% saltwater solution, a commercial mix such as Gatorade, or a combination of these with fresh water. The replacement fluid should be kept cool, 50°F to 60°F, and it should be placed close to the work area. Employees must be encouraged to drink more than the amount required to satisfy thirst. Employees should also be encouraged to salt their foods more heavily during hot times of the year.

Cooling devices such as vortex tubes or cooling vests can be worn beneath impermeable clothing. If cooling devices are worn, only physiological monitoring will be used to determine work activity.

All site personnel are to rest when any symptoms of heat stress are noticed. Rest breaks are to be taken in a cool, shaded rest area. Employees shall remove chemical protective garments during rest periods and will not be assigned other tasks.

All employees shall be informed of the importance of adequate rest and proper diet, including the harmful effects of excessive alcohol and caffeine consumption.

### 12.2.2.3 Monitoring

Heat stress monitoring should be performed when employees are working in environments exceeding 90°F ambient air temperature. If employees are wearing impermeable clothing, this monitoring should begin at 77°F. There are two general types of monitoring that the health and safety representative can designate to be used: wet bulb globe temperature (WBGT), and physiological. The Heat Stress Monitoring Record form (see Appendix A) will be used to record the results of heat stress monitoring.

Note that some states such as Washington and California have specific regulatory standards for protection of employees from heat stress-related injuries.

**Wet Bulb Globe Temperature (WBGT).** The WBGT index is the simplest and most suitable technique to measure the environmental factors that most nearly correlate with core body temperature and other physiological responses to heat. When WBGT exceeds 25°C (77°F), the work regimen in Table 12-4 should be followed.

**Table 12-4**  
**Permissible Heat Exposure Threshold Limit Values**

| Work/Rest Regimen                                                                                                                                                                                                                                     | Workload      |               |               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|---------------|
|                                                                                                                                                                                                                                                       | Light         | Moderate      | Heavy         |
| Continuous work                                                                                                                                                                                                                                       | 86°F (30.0°C) | 80°F (26.7°C) | 77°F (25.0°C) |
| 75% work, 25% rest each hour                                                                                                                                                                                                                          | 87°F (30.6°C) | 82°F (28.0°C) | 78°F (25.9°C) |
| 50% work, 50% rest, each hour                                                                                                                                                                                                                         | 89°F (31.4°C) | 85°F (29.4°C) | 82°F (27.9°C) |
| 25% work, 75% rest, each hour                                                                                                                                                                                                                         | 90°F (32.2°C) | 88°F (31.1°C) | 86°F (30.0°C) |
| These TLVs assume that nearly all acclimated, fully-clothed site personnel with adequate water and salt intake should be able to function effectively under the given working conditions without exceeding a deep body temperature of 100.4°F (38°C). |               |               |               |

(From OSHA Technical Manual, Section III: Chapter 4 - Heat Stress)

The TLVs denoted in Table 12-4 apply to physically fit and acclimatized individuals wearing light, summer clothing. If heavier clothing that impedes sweat or has a higher insulation value is required, the permissible heat exposure TLVs should be adjusted based on the WBGT Correction Factors in Table 12-5.

**Table 12-5**  
**Wet Bulb Globe Temperature Correction Factors**

| Clothing Type                       | WBGT Correction |
|-------------------------------------|-----------------|
| Summer lightweight working clothing | 0°F (0°C)       |
| Cotton coveralls                    | -3.6°F (-2°C)   |
| Winter work clothing                | -7.2°F (-4°C)   |
| Water barrier, permeable            | -10.8°F (-6°C)  |
| Fully encapsulating                 | -14.4°F (-10°C) |

**Physiological.** Physiological monitoring can be used in lieu of, or in addition to, WBGT. This monitoring can be self-performed once the health and safety representative demonstrates appropriate techniques to affected employees. Because individuals vary in their susceptibility to heat, this type of monitoring has its advantages. The following two parameters are to be monitored at the beginning of each rest period:

- **Heart Rate:** The maximum heart rate (MHR) is the amount of work (beats) per minute a healthy person's heart can be expected to safely deliver. Each individual will count his/her radial (wrist) pulse for 1 minute as early as possible during each rest period. If the heart rate of any individual exceeds 75% of his/her calculated MHR ( $MHR = 200 - \text{age}$ ) at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work until his/her sustained heart rate is below 75% of his/her calculated MHR.
- **Temperature:** Each individual will measure his/her temperature with a thermometer for 1 minute as early as possible in the first rest period. If the temperature exceeds 99.6°F at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work if his/her temperature exceeds 100.4°F.

#### 12.2.2.4 Training

Employees potentially exposed to heat stress conditions will be instructed on the contents of this procedure. This training can be conducted during daily tailgate safety meetings.

### 12.2.3 Cold Stress

Observe the following procedures and practices regarding cold stress:

- Take breaks in heated shelters when working in extremely cold temperatures.
- Upon entering the shelter, remove the outer layer of clothing and loosen other layers to promote evaporation of perspiration.
- Drink warm liquids to reduce the susceptibility to cold stress.

- Be aware of cold stress symptoms, including shivering, numbness in the extremities, and sluggishness.
- Provide adequate insulating dry clothing to maintain warmth if work is performed in air temperature below 40°F. Wind chill cooling rates and the cooling power of air are critical factors. The higher the wind speed and the lower the temperature in the work area, the greater the insulation value of the protective clothing required.
- If the air temperature is 32°F or less, hands should be protected.
- If only light work is involved and if the clothing on the worker may become wet on the job site, the outer layer of the clothing in use should be impermeable to water. With more severe work under such conditions, the outer layer should be water repellent, and the outer wear should be changed as it becomes wetted. The outer garments should include provisions for easy ventilation in order to prevent wetting of the inner layer by sweat.
- If available clothing does not give adequate protection to prevent cold injury, work should be modified or suspended until adequate clothing is made available, or until weather conditions improve.
- Implement a buddy system in which site personnel are responsible for observing fellow workers for early signs and symptoms of cold stress.

### 12.2.3.1 Signs, Symptoms, and Treatment

Cold stress can range from frostbite to hypothermia. The signs and symptoms of cold stress are listed below. The appropriate guidelines should be followed if any personnel exhibit these symptoms:

**Frostbite.** Frostbite is characterized by pain in the extremities and loss of manual dexterity.

"Frostnip," or reddening of the tissue, is accompanied by a tingling or loss of sensation in the extremities and continuous shivering.

**Hypothermia.** Hypothermia is characterized by pain in the extremities and loss of manual dexterity, with severe, uncontrollable shivering, and an inability to maintain the level of activity. Symptoms include excessive fatigue, drowsiness, irritability, or euphoria. Severe hypothermia includes clouded consciousness, low blood pressure, pupil dilation, cessation of shivering, unconsciousness, and possible death.

Move the individual to a warm, dry place. If the individual's clothing is wet, remove it and replace it with dry clothing. Keep the individual warm. Re-warming of the individual should be gradual to avoid stroke symptoms. Dehydration, or the loss of body fluids, may result in a cold injury due to a significant change in blood flow to the extremities. If the individual is conscious and alert, warm sweet liquids should be provided. Coffee and other caffeinated liquids should be avoided because of diuretic and circulatory effects. Extremities affected by frostbite should be gradually warmed up and returned to normal temperature. Moist compresses should be applied; begin with lukewarm



compresses and slowly increase the temperature as changes in skin temperature are detected. Keep the individual warm and calm and move them to a medical facility as soon as possible.

### *12.2.4 Sunlight and Ultraviolet Exposure*

Observe the following procedures and practices regarding ultraviolet (UV) exposure:

- Protect against extended exposure to sunlight with shade, long clothing, sunscreen, and high-SPF, broad-spectrum sunscreen applied frequently.
- Plan work to avoid unnecessary UV exposure (see Section 12.2.4.2).
- During peak daylight months, plan work for early morning or evening.
- Many factors affect the hazards associated with UV exposure, including the following:
- **Time of day:** UV rays are strongest between 10:00 a.m. and 4:00 p.m.
- **Season of the year:** UV rays are stronger during spring and summer months. This is less of a factor near the equator.
- **Distance from the equator (latitude):** UV exposure goes down as you get farther from the equator.
- **Altitude:** More UV rays reach the ground at higher elevations.
- **Cloud cover:** The effect of clouds can vary. Sometimes cloud cover blocks some UV from the sun and lowers UV exposure, while some types of clouds can reflect UV and increase UV exposure. What is important to know is that UV rays can get through, even on a cloudy day. Consider monitoring the UV index for your work area: <http://www2.epa.gov/sunwise/uv-index>.
- **Reflection off surfaces:** UV rays can bounce off surfaces like water, sand, snow, pavement, or grass, leading to an increase in UV exposure.
- Evaluate site-specific factors affecting UV exposure and address work practices as appropriate.

#### **12.2.4.1 Signs, Symptoms, and Treatment**

The best way to treat sunburn is to prevent it using the guidelines listed in the preceding bullets and in Section 12.2.4.2. Signs of sunburn include the following:

- Pinkness or redness
- Skin that feels warm or hot to the touch
- Pain, tenderness, or itching
- Swelling
- Small, fluid-filled blisters, which may break
- Headache, fever, chills, and fatigue if the sunburn is severe

If signs of sunburn are noticed, avoid further exposure and immediately implement treatment. If the sunburn is blistering *and* covers 15% or more of the body, seek medical attention.

#### 12.2.4.2 Prevention

UV exposure hazards and their impacts on each worksite should be evaluated to determine the best practices for risk mitigation. The most effective way to prevent skin damage from UV exposure is to protect bare skin from the exposure. This can be accomplished with shade, clothing (e.g., pants, long sleeves, or hats), sunscreen, and sunglasses. Plan work to either create shade or take advantage of natural shade, and avoid peak UV times during the day when possible.

#### 12.2.5 Inclement Weather

Observe the following procedures and practices regarding inclement weather:

- Evaluate the worksite for hazards that may be amplified during inclement weather, such as traction issues, ingress and egress, slope stability, or wind-driven hazards (e.g., dust, debris, or falling trees).
- Stop outdoor work during electrical storms (lightning strikes), hailstorms, high winds, and other extreme weather conditions such as extreme heat or cold.
- Take cover indoors or in a vehicle that will provide adequate protection. In some cases, this may require exiting the worksite, such as during windstorms in areas with overhead hazards (e.g., trees or power lines).
- Listen to local forecasts for warnings about specific weather hazards such as tornadoes, hurricanes, and flash floods.
- Verify that on-site equipment and resources are adequately protected from inclement weather.
- If working in an unfamiliar geographic location, consult with local resources for unique weather hazards.

#### 12.2.6 Insects and Spiders

Observe the following general procedures and practices regarding insects/spiders:

- Tuck pants into socks.
- Wear long sleeves.
- Use insect repellent.
- Avoid contact by always looking ahead to where you will be walking, standing, sitting, leaning, grabbing, lifting, or reaching.
- Check for signs of insect/spider bites, such as redness, swelling, and flu-like symptoms.

The most dangerous spiders to humans in North America are black widows and brown spiders (also known as brown recluse or fiddleback spiders). A guide to identifying these spiders is presented in Table 12-6.

**Table 12-6**  
**North American Hazardous Spider Identification Guide**

| Hazardous Spider Identification Guide                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <p><b>Black Widow Spider</b></p> <ul style="list-style-type: none"> <li>• Abdomen usually shows hourglass marking</li> <li>• Female is 3 to 4 centimeters in diameter</li> <li>• Have been found in well casings and flush-mount covers</li> <li>• Not aggressive, but more likely to bite if guarding eggs</li> <li>• Light, local swelling and reddening are early signs of a bite, followed by intense muscular pain, rigidity of the abdomen and legs, difficulty breathing, and nausea</li> <li>• If bitten, see a physician as soon as possible</li> </ul>                            |   |
| <p><b>Brown Spiders (aka Brown Recluse or Fiddleback)</b></p> <ul style="list-style-type: none"> <li>• Found in the central and southern United States, although in some other areas, as well</li> <li>• 1/4-to-1/2-inch-long body, and size of a silver dollar</li> <li>• Hide in baseboards, ceiling cracks, and undisturbed piles of material</li> <li>• Bite may either go unnoticed or may be followed by a severe localized reaction, including scabbing, necrosis of the affected tissue, and very slow healing</li> <li>• If bitten, see a physician as soon as possible</li> </ul> |  |

### 12.2.7 Bees and Wasps

Many encounters with bees and wasps occur when nests built in well casings or excavation areas are disturbed. Before opening a well casing, take a few moments to observe whether or not insects are entering or exiting. If they are flying to and from the casing, avoid it if possible. If you must be in an area where disturbing a nest is likely, be sure to wear long pants and a long-sleeved shirt. Stinging insects fly around the top of their target, so if you get into trouble, pull a portion of your shirt over your head and run away.

If you get stung, look for a stinger and, if one is present, remove it as soon as possible. Several over-the-counter products or a simple cold compress can be used to alleviate the pain of the sting. If the sting is followed by severe symptoms, or if it occurs in the neck or the mouth, seek medical attention immediately because swelling could cause suffocation.

If you need to destroy a nest, consult with the PM and project FL first. Commercially available stinging insect control aerosols are very effective, but could potentially contaminate the well. Once the nest is destroyed, fine mesh may be applied over the exit and entry points of a well casing to prevent re-infestation.

### 12.2.8 Ticks

Ticks in North America can be carriers of several diseases, including Lyme disease, Rocky Mountain spotted fever, and ehrlichiosis.

Limiting exposure to ticks reduces the likelihood of infection when exposed to tick-infested habitats. Measures to prevent tick exposure include the following:

- Remove leaf litter and brush in areas where you will be working prior to tick season.
- Wear light-colored clothing so that ticks are visible.
- Tuck your pant legs into your socks.
- Apply repellents to discourage tick attachment.
- Promptly inspect your body and remove crawling or attached ticks when you leave a tick-infested area.
- Conduct tick checks on buddies upon exiting any suspect area (may be needed multiple times per work day).
- Be aware of seasonal activity; ticks are often most active in the spring.

Observe the following procedures and practices if you are bitten by a tick:

- Use fine-tipped tweezers or shield your fingers with tissue, paper towel, or rubber gloves.
- Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause mouthparts to break off and remain in the skin.
- Do not squeeze, crush, or puncture the body of the tick because its fluids may contain infectious organisms.
- Do not handle the tick with bare hands because infectious agents may enter through mucous membranes or breaks in the skin.
- After removing the tick, thoroughly disinfect the bite site and wash your hands with soap and water.
- You may wish to save the tick for identification in case you become ill within 2 to 3 weeks. Place the tick in a sealed plastic bag in the freezer, and mark the bag with the date of the bite.

### 12.2.9 Mosquitoes

Mosquitoes in the United States have been known to carry West Nile virus, Zika virus, St. Louis encephalitis, and dengue fever. Avoid mosquito bites by doing the following:

- Apply insect repellent containing DEET (N,N-diethyl-meta-toluamide) when outdoors. DEET is very effective, but could potentially contaminate samples.
- Read and follow the product directions whenever you use insect repellent.

- Wear long-sleeved clothes and long pants treated with repellent to further reduce your risk, or stay indoors during peak mosquito feeding hours (dusk until dawn).
- Limit the number of places available for mosquitoes to lay their eggs by eliminating standing water sources from around the work area.
- If you need to destroy a nest, consult with the PM and project FL first.
- Check to see if there is an organized mosquito control program near the project site. If no program exists, work with the local government officials to establish a program.

### 12.2.9.1 Zika Virus

The Zika virus has generated concern starting in 2016 in the southern United States. According to the Centers for Disease Control and Prevention (CDC),<sup>4</sup> Zika infection during pregnancy can cause a birth defect of the brain called microcephaly and other severe fetal brain defects. There have also been increased reports of Guillain-Barré syndrome, an uncommon sickness of the nervous system, in areas affected by Zika. The practices listed in the bullets above should be followed to avoid mosquito bites and help prevent contraction of the Zika virus. Symptoms of Zika and treatment options are listed below, should you suspect that you or another employee has been in contact with Zika-infected mosquitoes:

- The most common symptoms of Zika (similar to those of dengue fever) are fever, rash, joint pain, or conjunctivitis (red eyes). Other common symptoms include muscle pain and headache. The incubation period (the time from exposure to symptoms) for Zika virus disease is not known, but is likely to be a few days to a week.
- The illness is usually mild, with symptoms lasting for several days to a week. Severe disease requiring hospitalization is uncommon.
- Call WorkCare or see your healthcare provider if you develop the symptoms described above and have visited an area where Zika is found. If you have recently traveled, tell your healthcare provider when and where you traveled. Your healthcare provider may order blood tests to look for Zika or other similar viruses like dengue fever.

### 12.2.10 Venomous Snakes

Observe the following procedures and practices regarding poisonous snakes:

- Avoid walking in areas where snakes may nest or hide. When walking, always look ahead for signs of snakes.
- Use extreme caution when moving or lifting objects that could be used by snakes as cover.
- Never reach under or behind objects or into other areas where snakes may hide.
- Wear sturdy leather boots.

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<sup>4</sup> <https://www.cdc.gov/zika/about/overview.html>

- Poisonous snakebites are medical emergencies. If bitten by any type of snake, immediately seek medical attention.

### *12.2.11 Bird Droppings*

Large populations of roosting birds may present a disease risk. The most serious health risks arise from disease organisms that grow in the accumulations of bird droppings, feathers, and debris under a roost—especially if roosts have been active for years. Among the fungal diseases associated with bird droppings, the two most common are Histoplasmosis and Cryptococcosis.

If you are working in an area where large quantities of droppings are present, follow certain precautions to minimize the risk from disease organisms in the droppings:

- Wear a respirator that can filter particles as small as 0.3 microns, such as a HEPA filter.
- Wear disposable protective gloves, hat, coveralls, and boots if you will be in close contact.
- Wash or shower at the work site after cleanup, if possible.
- If allowable, modify the structure or use methods to prevent birds from re-establishing the roost.

### *12.2.12 Feral Dogs*

Feral (i.e., “wild” or “stray”) dogs have been observed at several Anchor QEA job sites. Packs of feral dogs can be dangerous, so if you observe them on the site, call animal control immediately. If a dog approaches you, take the following steps to reduce your chances of being attacked:

- Do not run away or run past the dog.
- Remain calm. If you say anything, speak calmly and firmly. Avoid eye contact. Try to stay still until the dog leaves, or back away slowly until the dog is out of sight. Do not turn and run.
- If you fall to the ground or are knocked down, curl into a ball, placing your hands over your head and neck. Protect your face.

If a dog bites someone, take the following steps:

- Restrain the dog immediately, if it is safe to do so. The dog will have to be quarantined or tested for rabies.
- Check on the victim’s condition. Call 911 if paramedic response is required.

### 12.2.13 Bears

Though bear attacks in the wild are extremely rare, both grizzly and black bears have the potential to occur within project sites in North America. A guide to identifying these bears is presented in Table 12-8. Observe the following general procedures and practices regarding bears:

- Don't surprise bears. If you're walking, make your presence known. Make noise by talking loudly.
- Always travel with a group. Groups are noisier and easier for bears to detect.
- Keep in mind that bears tend to be more active at dawn and dusk, so plan field work accordingly.
- Keep an eye out for tracks, scat, digs, and trees that bears have rubbed.

**Table 12-8**  
**North American Bear Identification Guide**

| Bear Identification Guide                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <p><b>Grizzly Bear (uncommon)</b></p> <ul style="list-style-type: none"> <li>• Color: Ranges from black to light blonde; mostly medium to dark brown. Long hair usually has a lighter tip (hence the "grizzled" look)</li> <li>• Size: Average 350 to 500 pounds; larger grizzlies can reach 800 pounds</li> <li>• Height: 3.3 feet at shoulder; 6.5 feet standing</li> <li>• Shape: Distinct shoulder hump</li> <li>• Face: Depression between eyes and end of nose; short, round ears</li> <li>• Claws: Very long (2 to 4 inches)</li> <li>• Prints: Minimal arc in toes, toe imprints close together, and claws leave long, visible marks</li> </ul>                                                                                       |   |
| <p><b>Black Bear</b></p> <ul style="list-style-type: none"> <li>• Color: Ranges from black to light blonde; many have a lighter patch on chest, and reddish-colored bears are common in the west</li> <li>• Size: Average 110 to 300 pounds; large males can reach 400 pounds and be larger than a female grizzly bear</li> <li>• Height: 2.5 to 3 feet at shoulder; approximately 5 feet standing</li> <li>• Shape: No hump</li> <li>• Face: Straight line runs between forehead and end of nose; larger, pointed ears compared to grizzly bear</li> <li>• Claws: Shorter than grizzly bear (approximately 1.5 inches)</li> <li>• Prints: Large toe arc; toe imprints farther apart, and claws usually do not leave an impression</li> </ul> |  |

Source: <http://usparks.about.com/od/backcountry/a/Bear-Safety.htm>

### 12.2.14 Mountain Lions (Cougars), Wolves, and Coyotes

Mountain lions (cougars), gray wolves, and coyotes also have the potential to occur within project sites in North America. Gray wolves are very rare and attacks in the wild are extremely rare. Coyotes

are more common, but are rarely seen during the daytime. It is difficult to distinguish between wolves, coyotes, and feral dogs, especially if the light is bad, the sighting is brief, or the animal is far away. Table 12-9 lists the differences in physical appearance between canids. The following practices and procedures should be followed when working in areas that cougars or wolves may inhabit (source: [www.bearinfo.org](http://www.bearinfo.org)):

- Hike in groups and make enough noise to avoid surprising a cougar or wolf.
- Do not approach dead animals, especially deer or elk; they could have been cougar or wolf prey left for a later meal.

If you see or encounter a cougar or a wolf:

- Stop immediately and do not run. Running and rapid movements may trigger an attack. At close range, a cougar's instinct is to chase.
- Face the animal. Talk to it firmly while slowly backing away. Always leave the animal an escape route. Do not take your eyes off the animal or turn your back. Do not crouch down or try to hide.
- Try to appear larger than the animal. Get above it (e.g., step up onto a rock or stump). If wearing a jacket, hold it open to further increase your apparent size. If you are in a group, stand shoulder-to-shoulder to appear intimidating.
- In the rare instance that the animal does not flee, be more assertive. If it shows signs of aggression, shout, wave your arms or a stick, and throw anything you have available (water bottle, book, backpack). The idea is to convince the animal that you are not prey, but a potential danger.
- If an animal attacks, fight back. Be aggressive and try to stay on your feet. Cougars and wolves have been driven away by people who have fought back using anything within reach, including sticks, rocks, shovels, backpacks, and clothing—even bare hands. If you are aggressive enough, an animal will flee, realizing it has made a mistake.
- In the case of an aggressive wolf, climb a tree if necessary; wolves cannot climb trees.  
*Do not use this method for cougars.*



**Table 12-9**  
**North American Wolf Identification Guide**

| Differences in Physical Appearance Between Canids                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <p><b>Gray Wolf</b></p> <ul style="list-style-type: none"> <li>• Color: Black, white, all shades of gray and tan, grizzled, never spotted</li> <li>• Size: 70 to 115 pounds</li> <li>• Height: 26 to 34 inches</li> <li>• Tail carriage: Hangs down or straight, never curls</li> <li>• General appearance: Massive, long legged, first impression is often calf or deer</li> <li>• Ears: Rounded, relatively short, never hang down</li> <li>• Muzzle: Large and blocky</li> </ul>    |   |
| <p><b>Coyote</b></p> <ul style="list-style-type: none"> <li>• Color: All shades of gray and tan, white or black are very rare, never spotted</li> <li>• Size: 20 to 35 pounds</li> <li>• Height: 16 to 20 inches</li> <li>• Tail carriage: Hangs down or straight, never curls</li> <li>• General appearance: Delicate, medium size, dog-like proportions with fox-like face</li> <li>• Ears: Pointed, relatively long, never hang down</li> <li>• Muzzle: Long and pointed</li> </ul> |  |

Source: [http://www.alaska.net/~wolfsong/wolf\\_id.html](http://www.alaska.net/~wolfsong/wolf_id.html)

### 12.2.15 Rodent-Borne Diseases

Rodent infestation on a site has the potential to cause serious communicable diseases including hantavirus pulmonary syndrome and bubonic plague. The most common rodent-borne disease is hantavirus, which may infect workers who inhale tiny droplets containing the virus when fresh rodent urine, droppings, or nesting materials are stirred up.

Working conditions that may put workers at risk of hantavirus include:

- Contact with rodent feces or dried urine, which may mobilize particles of these wastes into the air where they may be inhaled
- Entry into rooms or warehouses that have been closed up and infested for extended periods
- Activities that stir up dust that may mobilize hantavirus

If working in areas of obvious rodent infestation, the CDC recommends the following precautions:

- Do not enter rooms or warehouses that have been closed up unless absolutely necessary.
- If work in closed-up areas or areas with rodent infestation is necessary, contact professional exterminators to eliminate the infestation and clean up the location
- If an exterminator is not available or possible, employees should clean up the infested area using the following steps:

- When going into outbuildings or rooms that have been closed for an extended period, open them up and air them out before cleaning.
- Don an APR equipped with HEPA P-100 cartridges and nitrile gloves before cleaning.
- Do not stir up dust by sweeping or vacuuming droppings, urine, or nesting materials.
- Thoroughly wet contaminated areas with detergent or liquid to deactivate the virus. Most general-purpose disinfectants and household detergents are effective. However, a hypochlorite solution prepared by mixing 1 and 1/2 cups of household bleach in 1 gallon of water may be used in place of a commercial disinfectant.
- Once everything is wet, pick up contaminated materials with a damp towel, then mop or sponge the area with disinfectant.
- Spray dead rodents with disinfectant and flea repellent (to avoid bubonic plague), then double-bag and dispose of in an appropriate waste disposal system. Contact the local or state health department for other disposal methods.
- Finally, remove respirator and disinfect gloves before taking them off with disinfectant or soap and water. After taking off the clean gloves, thoroughly wash hands with soap and warm water.

If you experience hantavirus symptoms (fatigue, fever, and muscle aches) within 1 to 5 weeks of exposure to potentially affected rodents and their droppings, contact your supervisor immediately.

### *12.2.16 Poisonous Plants*

Poisonous plants include poison ivy, poison oak, and poison sumac as shown in Table 12-10.

Observe the following procedures and practices regarding poisonous plants:

- Avoid entering areas infested with poisonous plants.
- Immediately wash any areas that come into contact with poisonous plants.
- Use PPE when there is a possibility of contact with poisonous plants.

**Table 12-10**  
**North American Hazardous Plant Identification Guide**

| Hazardous Plant Identification Guide                                                                                                                                                                                                                                                                                                                          |                                                                                     |                                                                                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <b>Poison Ivy</b> <ul style="list-style-type: none"> <li>• Grows in the West, Midwest, Texas, and the East Coast</li> <li>• Several forms—vine, trailing shrub, or shrub</li> <li>• Three leaflets (can vary from three to nine)</li> <li>• Leaves are green in summer and red in fall</li> <li>• Yellow or green flowers</li> <li>• White berries</li> </ul> |   |   |
| <b>Poison Oak</b> <ul style="list-style-type: none"> <li>• Grows in the East (New Jersey to Texas) and Pacific Coast</li> <li>• 6-foot tall shrubs or long vines</li> <li>• Oak-like leaves in clusters of three</li> <li>• Yellow berries</li> </ul>                                                                                                         |   |   |
| <b>Poison Sumac</b> <ul style="list-style-type: none"> <li>• Grows in boggy areas, especially in the Southwest and Northern United States</li> <li>• Shrub up to 15 feet tall</li> <li>• Seven to 13 smooth-edged leaflets</li> <li>• Glossy pale yellow or cream-colored berries</li> </ul>                                                                  |  |  |

If you have been exposed to poison ivy, oak, or sumac, act quickly because the toxin in the plants penetrates the skin within minutes. If possible, stay outdoors until you complete the first two steps:

1. Cleanse the exposed skin with generous amounts of isopropyl alcohol.
2. Wash the skin with water.
3. Take a regular shower with soap and warm water. Do not use soap until this point because it will pick up the toxin from the surface and move it around.
4. Wash clothes, tools, and anything else that may have been in contact with the toxin with alcohol and water. Be sure to wear hand protection during that process.

Signs and symptoms of exposure include redness and swelling that appears 12 to 48 hours after exposure. Blistering and itching will follow. If you have had a severe reaction in the past, you should see a physician right away. Over-the-counter products that are available to alleviate symptoms include Cortaid, Lanacort, baking soda, Aveeno oatmeal baths, and calamine lotion.

### *12.2.17 The Public at Large*

The community residents around worksites may pose their own specific hazards. These conditions may include the following:

- Unintentional disruption of work
- Benign or malicious trespass
- Criminal intent

Scenarios may include the following:

- Pedestrians, cyclists, or motorists disregarding site boundaries due to distraction or willful disobedience.
- Public use of private site facilities for shelter, relief, and other reasons with no ill-intention.
- Public use of private site facilities for mischievous or criminal activity, such as loitering, vandalism, or theft.
- Encounters with community members who are disgruntled with the project activity.
- Encounters with criminal activities on or near a project site.

If any of the previously mentioned scenarios are anticipated to be likely, take the following precautions as appropriate:

- Verify that the site is adequately marked and barricaded to limit unintentional disruptions of the work by the public.
- Review the site for attractive nuisances (e.g., hazards or conditions that are likely to attract children), and mitigate those.
- Secure all equipment and site facilities to prevent unauthorized access or use.
- Remove valuable items from the site or adequately secure them on site to limit the temptation for potential criminals.
- Have contact information for the client's or owner's public relations office while on site, and direct disgruntled community members to that office. If necessary, vacate the site to relieve the situation and notify the PM or FL.
- Work in pairs when uncertain of the public safety situation at a site. In questionable situations, postpone work as necessary until a plan of action can be developed to verify a safe working environment.

### *12.2.18 Personal Health and Safety*

In addition to hazards associated with chemicals of concern, equipment, operations, or site conditions discussed above, there may be additional personal safety issues to consider at a site, including those related to one or multiple protected classes, such as race, gender, religion, ability,

sexual orientation, or gender identity. These conditions may involve the following, perpetrated by the public or those associated with the work:

- Malicious disruption of work
- Harassment, including unwanted comments, gestures, or actions
- Threats of violence, either implied (using derogatory language) or explicit
- Assault

It is critical that the work environment be discussed within the project team to evaluate risks, ways to avoid those risks, and communication protocols. Anchor QEA requires that work be performed in teams.

Specifically, if any of the above are anticipated, take the following precautions as appropriate:

- Alert the PM, FL, DOHS, and Human Resources Department of potential issue(s).
- Formulate a plan of action to verify and maintain a safe working environment prior to field work, which may include the following:
  - Working in pairs and/or within a certain physical distance of other work groups.
  - Coordinated check-ins (calls to or from the office or visual check-ins with other field members).
- Whenever possible, schedule work only within daylight hours (which fluctuate seasonally) or on weekends when questionable scenarios may be less likely.
- If night work is required, maintain a minimum of two field personnel at all times, and potentially increase the total number of personnel.
- If working in high-risk areas, discuss the possibility of hiring security if work needs to be performed at night, in low light, or near potentially dangerous areas (e.g., abandoned buildings, public displays of hostility, discrimination, or gang-related activity).
- Maintain a field phone with active GPS and non-locking 911 capability at all times while out in the field.
- If a need arises for a change in field work (e.g., additional sampling or moving to an area that was not planned) or travel plans (e.g., dead battery or flat tire), immediately alert the FL and PM as to the event.

In addition, practice active awareness of your environment. Discuss personal health and safety concerns at the daily tailgate meeting. If you feel unsafe based on the potential behavior of others, immediately bring it up to field team coworkers. If the issue is not resolved to your satisfaction, alert the PM, FL, DOHS, and Human Resources Department to assist in resolving any potential issue(s).

## 13 Medical Monitoring Program

This section describes the medical monitoring program that Anchor QEA field personnel must comply with when working on sites where there is a potential for exposure to hazardous wastes or other hazardous substances.

### 13.1 General Requirements

Anchor QEA employees shall be enrolled in a medical monitoring program in compliance with OSHA standards (29 CFR 1910.120(f)) under the following circumstances:

- If they are involved with any of the following operations:
- *Cleanup operations* required by a governmental body, whether federal, state, local, or other involving hazardous substances that are conducted at uncontrolled hazardous waste sites (including, but not limited to, the EPA's National Priority List [NPL] sites, state priority list sites, sites recommended for the EPA NPL, and initial investigation of government-identified sites that are conducted before the presence or absence of hazardous substances has been ascertained)
- *Corrective actions* involving cleanup operations at sites covered by the Resource Conservation and Recovery Act of 1976 (RCRA) as amended (42 United States Code 6901 et seq)
- *Voluntary cleanup operations* at sites recognized by federal, state, local, or other governmental bodies as uncontrolled hazardous waste sites
- *Operations involving hazardous wastes* that are conducted at treatment, storage, and disposal (TSD) facilities regulated by 40 CFR 264 and 40 CFR 265 pursuant to RCRA or by agencies under agreement with the EPA to implement RCRA regulations
- *Emergency response operations* for releases of, or substantial threats of releases of, hazardous substances without regard to the location of the hazard
- And, if they meet the following criteria:
- Are or may be exposed to hazardous substances or health hazards at or above the established PEL, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more per year
- In addition, employees are required to be enrolled in the medical monitoring program if they meet any of the following conditions:
- Wear a respirator for 30 days or more per year
- Are injured, become ill, or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operations
- Are members of a Hazardous Materials (HAZMAT) team

Anchor QEA employees required to be enrolled in a medical monitoring program under 29 CFR 1910.120(f) shall have medical examinations and consultations made available to them by Anchor QEA on the following schedule:

- Prior to assignment
- At least once every 12 months unless the attending physician believes a longer interval (not greater than biennially) is appropriate
- At termination of employment or reassignment to an area where the employee would not be covered if the employee has not had an examination within the last 6 months
- As soon as possible upon notification that the employee has developed signs or symptoms indicating possible overexposure to hazardous substances or health hazards, or that the employee has been injured or exposed above the PEL or published exposure levels in an emergency situation
- At more frequent times, if the examining physician determines that an increased frequency of examination is medically necessary

The content of medical examinations or consultations made available to employees shall be determined by the attending physician but shall include, at a minimum, a medical and work history with special emphasis on symptoms related to the handling of hazardous substances and health hazards, and to fitness for duty including the ability to wear any required PPE under conditions (i.e., temperature extremes) that may be expected at the work site.

The attending physician shall provide Anchor QEA with a written opinion for each examined employee that contains the following information:

- Whether the employee has any detected medical conditions that would place the employee at an increased risk of impairment of the employee's health from hazardous waste operations work, emergency response, or respirator use
- Any recommended limitations on the employee's assigned work
- A statement that the employee has been informed of the results of the medical examination and any medical conditions that require further examination or treatment

The written opinion obtained by Anchor QEA shall not reveal specific findings or diagnoses unrelated to occupational exposures. Medical monitoring and other employee-related medical records shall be retained for at least the duration of employment plus 30 years.

## 13.2 Team Self-Monitoring

All personnel will be instructed to look for and inform each other of any deleterious changes in their physical or mental condition during the performance of all field activities. Examples of such changes are as follows:

- Headaches
- Dizziness
- Nausea
- Blurred vision
- Cramps
- Irritation of eyes, skin, or respiratory system
- Skin chafing from damp or wet clothing
- Changes in complexion or skin color
- Changes in apparent motor coordination
- Increased frequency of minor mistakes
- Excessive salivation or changes in papillary response
- Changes in speech ability or speech pattern
- Symptoms of heat stress or heat exhaustion
- Symptoms of hypothermia

If any of these conditions develop, the affected person will be moved from the immediate work location and evaluated. If further assistance is needed, personnel at the local hospital will be notified, and an ambulance will be summoned if the condition is thought to be serious. If the condition is the result of sample collection or processing activities, procedures and/or PPE will be modified to address the problem.



## Appendix A

### Health and Safety Logs and Forms

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# Utility Contact Prevention Checklist

*NOTE: Utility mark-out requirements vary from state to state; consult state authorities before beginning work.*

**Purpose:** This form is intended to help the Field Lead confirm that underground or overhead utilities are identified to the extent practicable and consistent with applicable regulations **PRIOR** to site work.

## **INVESTIGATIONS MUST NOT OCCUR UNTIL MULTIPLE LINES OF EVIDENCE INDICATE THAT SUBSURFACE OR OVERHEAD UTILITIES ARE NOT PRESENT IN THE WORK AREA**

Nepera Harriman Site Remediation  
**Project Name/No:** Program (233099-01.02) **Date:** \_\_\_\_\_  
**Field Lead:** Stephen Colquhoun **Project Address:** Arden House Road, Harriman, NY  
**Project Manager:** Sarah LaRoe **Health & Safety Officer:** Tim Shaner

**Emergency Contact Information for One Call:** \_\_\_\_\_

**Duration/Summary of Work to be Performed:** \_\_\_\_\_

| Consideration                                                                                                                           | Check                        |                             | Explanation | Initial |
|-----------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------------------------|-------------|---------|
| Has the state One Call been contacted?                                                                                                  | <input type="checkbox"/> Yes | <input type="checkbox"/> No |             |         |
| Has the property owner or client been contacted for local knowledge of utilities, as applicable?                                        | <input type="checkbox"/> Yes | <input type="checkbox"/> No |             |         |
| Does the property owner or client have specific utility contact prevention procedures and, if so, have they been completed?             | <input type="checkbox"/> Yes | <input type="checkbox"/> No |             |         |
| Are any as-built drawings available? If so, do they show any utilities?                                                                 | <input type="checkbox"/> Yes | <input type="checkbox"/> No |             |         |
| Has a visual inspection of the work area(s) been completed?                                                                             | <input type="checkbox"/> Yes | <input type="checkbox"/> No |             |         |
| Has the potential presence of in-water utilities been assessed (shore markers, streets dead-ending at water's edge, etc.)               | <input type="checkbox"/> Yes | <input type="checkbox"/> No |             |         |
| Is evidence of electrical utilities present? (electric meters on structures, conduits, overhead lines, light poles, etc.)               | <input type="checkbox"/> Yes | <input type="checkbox"/> No |             |         |
| Is evidence of water/sewer utilities present? (water meter, hydrants, restrooms, grates in ground, etc.)                                | <input type="checkbox"/> Yes | <input type="checkbox"/> No |             |         |
| Is evidence of telecommunications utilities present? (fiber optic warning signs, conduits from utility poles, wall-mounted boxes, etc.) | <input type="checkbox"/> Yes | <input type="checkbox"/> No |             |         |

# Utility Contact Prevention Checklist

*NOTE: Utility mark-out requirements vary from state to state; consult state authorities before beginning work.*

| Consideration                                                                                                                                                                                                                              | Check                        |                             | Explanation | Initial |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------------------------|-------------|---------|
| Is other evidence of utilities present? (unknown ground markings, manholes or valve covers, "Call Before You Dig" signs, linear asphalt or concrete repair characteristics, liner subsidence of ground surface, pin flags or stakes, etc.) | <input type="checkbox"/> Yes | <input type="checkbox"/> No |             |         |
| Has a private locating service been contacted?                                                                                                                                                                                             | <input type="checkbox"/> Yes | <input type="checkbox"/> No |             |         |
| Were any utilities identified and marked out through a private locating service? If so, duplicate mark-outs on site drawings.                                                                                                              | <input type="checkbox"/> Yes | <input type="checkbox"/> No |             |         |
| Are there any fiber optic cables, fuel lines, or high-pressure lines within 50 feet of work locations?                                                                                                                                     | <input type="checkbox"/> Yes | <input type="checkbox"/> No |             |         |
| If fiber optic cables, fuel lines, or high-pressure lines are within 50 feet, has an agreement with the utility owner been established?                                                                                                    | <input type="checkbox"/> Yes | <input type="checkbox"/> No |             |         |
| Can a test borehole be advanced by hand digging, probing, post-hole digging, and/or air knifing to 5 feet below ground surface (bgs)?                                                                                                      | <input type="checkbox"/> Yes | <input type="checkbox"/> No |             |         |
| If hand digging, probing, post-hole digging, and/or air knifing to 5 feet bgs is not possible, can a non-invasive geophysical investigation be conducted? If not, why?                                                                     | <input type="checkbox"/> Yes | <input type="checkbox"/> No |             |         |
| Other considerations:                                                                                                                                                                                                                      |                              |                             |             |         |

**NOTE: Please fill in second page and attach additional reports, drawings, or other information, as necessary.**

**Confirmation Number:** \_\_\_\_\_

**Contact Name:** \_\_\_\_\_ **Organization:** \_\_\_\_\_

**Contact Date:** \_\_\_\_\_ **Contact Time:** \_\_\_\_\_

**Response:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

*Completed by:*

Printed Name \_\_\_\_\_ Signature \_\_\_\_\_ Date \_\_\_\_\_

# Utility Contact Prevention Checklist



*NOTE: Utility mark-out requirements vary from state to state; consult state authorities before beginning work.*

Contractor:

---

Printed Name

Signature

Date

# Modification to Health and Safety Plan



**Date:** \_\_\_\_\_

**Project No:** 233099-01.02

**Project Name:** Nepera Harriman Site Remediation Program

**Modification:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Reason for Modification:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Site Personnel Briefed

**Name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

## Approvals

**Field Lead:** \_\_\_\_\_  
Printed Name Signature Date

**Project Manager:** \_\_\_\_\_  
Printed Name Signature Date

# Incident Report Form



Please immediately contact your manager when a work-related incident has occurred. It is your responsibility (or your manager's if you are not able) to contact Human Resources (HR) and Health and Safety (H&S) ASAP when an incident happens.

This Incident Report is the first form you must complete when a work-related incident has occurred. Once completed, forward this form to HR and H&S.

**Incident Type:** ☐ Injury ☐ Illness ☐ Near Miss ☐ Spill ☐ Fire ☐ Other \_\_\_\_\_

## Employees Involved in Incident

**Was anyone injured?** ☐ Yes ☐ No

(If **Yes**, complete **a** and **b** below)

### a. Information Regarding Injured or Ill Employee

**Full name:** \_\_\_\_\_  
**Street:** \_\_\_\_\_  
**City:** \_\_\_\_\_ **State:** \_\_\_\_\_ **Zip:** \_\_\_\_\_  
**Date of birth:** \_\_\_\_\_ **Sex:** \_\_\_\_\_  
**Date hired:** \_\_\_\_\_ **Job title:** \_\_\_\_\_

### b. Information about the Physician or Health Care Professional

**Was medical treatment required?** ☐ Yes ☐ No

**First aid only:** ☐ Yes ☐ No

**Name of physician/health care professional:** \_\_\_\_\_

**If treatment was given away from the worksite, where was it given?**

**Facility:** \_\_\_\_\_  
**Street:** \_\_\_\_\_  
**City:** \_\_\_\_\_ **State:** \_\_\_\_\_ **Zip:** \_\_\_\_\_

**Was employee treated in emergency room?** ☐ Yes ☐ No

**Was employee hospitalized overnight as an in-patient?** ☐ Yes ☐ No

**Did the employee miss a full day of work following the incident?** ☐ Yes ☐ No

**Date of last day worked:** \_\_\_\_\_

**Date of return to work:** \_\_\_\_\_

**Number of restricted days of work:** \_\_\_\_\_

# Incident Report Form



## Information about the Incident:

Date of incident:

---

Time of incident:

---

Location of incident:

---

Were there any witnesses?

☐ Yes ☐ No

Name and phone number of witness:

---

---

**What was employee doing just before the incident occurred?** Describe the activity, as well as the tools, equipment, or material the employee was using. Be specific (e.g., climbing a ladder while carrying roofing materials, spraying chlorine from hand sprayer, daily computer key-entry).

**What happened?** Tell us how the injury occurred (e.g., when ladder slipped on wet floor, worker fell 20 feet; worker was sprayed with chlorine when gasket broke during replacement; worker developed soreness in wrist over time).

# Incident Report Form



**If an injury or illness, what was it?** Tell us the part of the body that was affected and how it was affected.

**Employer Use Only:**

**Date Recorded in Incident Log:** \_\_\_\_\_ **By:** \_\_\_\_\_

**Investigation:**

**Date Investigation Started:** \_\_\_\_\_ **Date Investigation Concluded:** \_\_\_\_\_

**Investigation Team Leader and Title:** \_\_\_\_\_

**Investigation Team Member Names and Titles:**

| Name  | Title |
|-------|-------|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |



# Incident Report Form



**Root Cause Determination** (attach other sheets as necessary)

Any statements, photographs, sketches, or other documents should be attached to this document.

# Incident Report Form



**Corrective Actions:** \*Documentation supporting completion of corrective actions should be attached to this report.

| Corrective Action | Person Responsible | Due Date | Completion Date | Completion Notes | Completed By |
|-------------------|--------------------|----------|-----------------|------------------|--------------|
|                   |                    |          |                 |                  |              |
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## Liability Waiver

### Release from Liability, Waiver of Claims, and Indemnification

This liability release, waiver, and indemnification is required for participation in our various on-site activities, field trips, and site tours. Each participant must sign his/her own form.

In return for receiving permission from **Anchor QEA, LLC ("Anchor QEA")**, a Washington State Limited Liability Company, to participate in various on-site activities at the Nepera Inc., Harriman NY Site (location) on \_\_\_\_\_ (date) (collectively, the **"Activities"**), the undersigned participant (**"Participant"**), acting through and/or with the consent of his/her parent or legal guardian (if Participant is a minor or the subject of a guardianship), hereby agrees as follows:

1. I fully recognize the dangers of participating in the Activities, and I voluntarily assume all risks associated with my participation in the Activities. I understand that the dangers that I may encounter at the site(s) where the Activities take place (in each case, a **"Site"**) include, by way of example only and without limitation: exposure to contaminants; exposure to aerosol vapors; wild animals, poisonous snakes, and harmful insects; poisonous vegetation; drowning, sea sickness, and boating accidents; falling from steep slopes, cliffs, or narrow trails; landslides; rough terrain; lightning; wildfire; extremes of temperatures; and storms. I realize that there is also a risk of my becoming seriously ill or injured in an area remote from medical care and that Anchor QEA cannot guarantee the availability of emergency medical services or emergency transportation to medical facilities.
2. I agree that neither Anchor QEA nor any of its agents, representatives, partners, contractors, consultants, or employees: (a) shall have any liability for any defect or dangerous natural or artificial condition relating to any Site or any of the Activities; or (b) have made or are making any representation or warranty, expressed or implied, regarding: (i) the conditions of any Site; (ii) the safety of the Activities or any of the equipment to be used in connection with the Activities; (iii) any means of transportation to or from any Site; or (iv) any other aspect of any Site or any of the Activities.
3. I agree to take the responsibility to familiarize myself with the rules and regulations applicable to the Sites and the Activities, and to verify that I have been properly instructed in and understand the use of any equipment I am to use in the Activities. I realize that my participation in the Activities may require sustained strenuous physical activity. I am in good health, and am not aware of any physical or medical condition that might endanger myself or other participants in the Activities.
4. Acting for myself and my heirs, executors, personal representatives, and assigns, I forever release and discharge Anchor QEA and its agents, representatives, partners, contractors, consultants, or employees, and the successors and assigns of each of them (in each case, a **"Released Party"**), of and from all claims, losses, damages, costs, expenses, and other liabilities, including (but not limited to) reasonable attorneys' fees (in each case, a **"Claim"**), whether known or unknown,

foreseen or unforeseen, relating to property damage or the death, injury, pain, or mental trauma of myself or any other person, and resulting, directly or indirectly, from my participation in the Activities or my travel to or from any Site. Without limiting the above, I agree not to sue any of the Released Parties for any such Claims, to waive any such Claims that I may have at any time against any of the Released Parties, and to indemnify and defend each of the Released Parties against, and to hold each of the Released Parties harmless of and from any Claims resulting from my acts or omissions during the Activities or while at any Site.

5. I have read and understand the policies and procedures specified in the Health and Safety Plan (HASP) for this Site. This HASP may include company-specific appendices developed by entities other than Anchor QEA.

The undersigned Participant acknowledges and agrees that he/she has carefully read this Release from Liability, Waiver of Claims, and Indemnification and fully understands all of its contents, and their legal effect, and agrees that this Release from Liability, Waiver of Claims, and Indemnification (of which I have been given a copy to keep, with any attachments) is contractually binding, and is being signed by the undersigned Participant of his/her own free will.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Printed Name: \_\_\_\_\_ Email: \_\_\_\_\_

Street Address: \_\_\_\_\_  
(street address — no PO Boxes)

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

Phone Number: \_\_\_\_\_

Emergency Contact Name: \_\_\_\_\_

Emergency Contact's Phone Number: \_\_\_\_\_

## Consent and Release for Publications of Photographs

I, the undersigned, hereby grant Anchor QEA permission to take photographs of me, and irrevocably consent to and authorize the use and reproduction by Anchor QEA, or anyone duly authorized by Anchor QEA, of any and all such photographs, for any legitimate purposes, including for advertising, trade, and editorial purposes, at any time in the future in all media now known or hereafter developed, throughout the world. I also consent to the use of my name in connection with such photographs.

I hereby release, indemnify, and hold harmless Anchor QEA and its agents, representatives, partners, contractors, consultants, or employees from any and all claims that may result at any time by reason of

the use of my image and name, including, without limitation, claims of privacy. My heirs, executors, administrators, and assigns shall be bound by this consent and release. I am over the age of 18 years.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Printed Name: \_\_\_\_\_

## Consent and Signature of Parent or Guardian

(if Participant is under 18 years of age or the subject of a guardianship)

As the parent or guardian of \_\_\_\_\_, the Participant described in the foregoing Release from Liability, Waiver of Claims, and Indemnification with respect to taking part in the Activities which are described above, I hereby acknowledge that I have read and understood such Release from Liability, Waiver of Claims, and Indemnification, and Consent and Release for Publications of Photographs, and I hereby agree, individually and on behalf of my child or ward, to all of the terms of such Release from Liability, Waiver of Claims, and Indemnification, and Consent and Release for Publications of Photographs; and hereby give my permission to my child or ward to participate in such Activities.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Printed Name: \_\_\_\_\_ Email: \_\_\_\_\_

Street Address: \_\_\_\_\_

(street address — no PO Boxes)

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

Phone Number: \_\_\_\_\_

# Daily Safety Briefing Form



Date: \_\_\_\_\_  
Project No: 233099-01.02  
Project Name: Nepera Harriman Site Remediation Program

Submit a  
Playing It  
Safe Event

Person Conducting Meeting: \_\_\_\_\_ Health & Safety Officer: Tim Shaner Project Manager: Sarah LaRoe

## TOPICS COVERED: Highlighted topics are required

- |                                                                                                     |                                                                      |                                                         |
|-----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|---------------------------------------------------------|
| <input type="checkbox"/> Emergency Procedures and Evacuation Route                                  | <input type="checkbox"/> Lines of Authority                          | <input type="checkbox"/> Lifting Techniques             |
| <input type="checkbox"/> Directions to Hospital                                                     | <input type="checkbox"/> Communication                               | <input type="checkbox"/> Slips, Trips, and Falls        |
| <input type="checkbox"/> HASP Review and Location                                                   | <input type="checkbox"/> Site Security                               | <input type="checkbox"/> Hazard Exposure Routes         |
| <input type="checkbox"/> Safety Equipment Location                                                  | <input type="checkbox"/> Vessel Safety Protocols                     | <input type="checkbox"/> Heat and Cold Stress           |
| <input type="checkbox"/> Proper Safety Equipment Use                                                | <input type="checkbox"/> Work Zones                                  | <input type="checkbox"/> Overhead and Underfoot Hazards |
| <input type="checkbox"/> Employee Right-to-Know/ SDS Location                                       | <input type="checkbox"/> Vehicle Safety and Driving/ Road Conditions | <input type="checkbox"/> Chemical Hazards               |
| <input type="checkbox"/> Fire Extinguisher Location                                                 | <input type="checkbox"/> Equipment Safety and Operation              | <input type="checkbox"/> Flammable Hazards              |
| <input type="checkbox"/> Eye Wash Station Location                                                  | <input type="checkbox"/> Proper Use of PPE                           | <input type="checkbox"/> Biological Hazards             |
| <input type="checkbox"/> Buddy System                                                               | <input type="checkbox"/> Decontamination Procedures                  | <input type="checkbox"/> Eating/Drinking/Smoking        |
| <input type="checkbox"/> Self and Coworker Monitoring                                               | <input type="checkbox"/> Near Miss Reporting Procedures              | <input type="checkbox"/> Reviewed Prior Lessons Learned |
| <input type="checkbox"/> Field Team Medical Conditions for Emergency Purposes (Confidential): _____ |                                                                      |                                                         |

☐ Other: \_\_\_\_\_

| <b>Weather Conditions:</b> _____<br>_____<br>_____<br><b>Daily Work Scope:</b> _____<br>_____<br>_____<br><b>Site-specific Hazards:</b> _____<br>_____<br>_____<br><b>Safety Comments:</b> _____<br>_____<br>_____ | <table border="1"><thead><tr><th colspan="2">Attendees</th></tr><tr><th>Printed Name</th><th>Signature</th></tr></thead><tbody><tr><td> </td><td> </td></tr><tr><td> </td><td> </td></tr><tr><td> </td><td> </td></tr><tr><td> </td><td> </td></tr><tr><td> </td><td> </td></tr><tr><td> </td><td> </td></tr><tr><td> </td><td> </td></tr><tr><td colspan="2">End of Day Wellness Check</td></tr><tr><td> </td><td> </td></tr><tr><td> </td><td> </td></tr><tr><td> </td><td> </td></tr><tr><td> </td><td> </td></tr><tr><td> </td><td> </td></tr></tbody></table> | Attendees |  | Printed Name | Signature |  |  |  |  |  |  |  |  |  |  |  |  |  |  | End of Day Wellness Check |  |  |  |  |  |  |  |  |  |  |  |
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| Attendees                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           |  |              |           |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                           |  |  |  |  |  |  |  |  |  |  |  |
| Printed Name                                                                                                                                                                                                       | Signature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |           |  |              |           |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                           |  |  |  |  |  |  |  |  |  |  |  |
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| End of Day Wellness Check                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           |  |              |           |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                           |  |  |  |  |  |  |  |  |  |  |  |
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|                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           |  |              |           |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                           |  |  |  |  |  |  |  |  |  |  |  |
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# Heat Stress Monitoring Record



**Date:** \_\_\_\_\_  
**Project No:** 233099-01.02  
**Project Name:** Nepera Harriman Site Remediation Program  
**Location:** Arden House Road, Harriman, NY

| Employee Name | Monitoring Results    |                         |             |               |                          |               |                         |               |                          |               |                         |               |                         |
|---------------|-----------------------|-------------------------|-------------|---------------|--------------------------|---------------|-------------------------|---------------|--------------------------|---------------|-------------------------|---------------|-------------------------|
|               | Initial Reading Time: | First Work Period Time: |             |               | Second Work Period Time: |               | Third Work Period Time: |               | Fourth Work Period Time: |               | Fifth Work Period Time: |               | Sixth Work Period Time: |
|               | WBGT (°F):            | WBGT (°F):              |             |               | WBGT (°F):               |               | WBGT (°F):              |               | WBGT (°F):               |               | WBGT (°F):              |               | WBGT (°F):              |
|               | Air Temp (°F):        | Air Temp (°F):          |             |               | Air Temp (°F):           |               | Air Temp (°F):          |               | Air Temp (°F):           |               | Air Temp (°F):          |               | Air Temp (°F):          |
|               | Initial Temp:         | Initial Temp:           | Final Temp: | Initial Temp: | Final Temp:              | Initial Temp: | Final Temp:             | Initial Temp: | Final Temp:              | Initial Temp: | Final Temp:             | Initial Temp: | Final Temp:             |
|               | Initial H.R.:         | Initial H.R.:           | Final H.R.: | Initial H.R.: | Final H.R.:              | Initial H.R.: | Final H.R.:             | Initial H.R.: | Final H.R.:              | Initial H.R.: | Final H.R.:             | Initial H.R.: | Final H.R.:             |
|               | Initial Temp:         | Initial Temp:           | Final Temp: | Initial Temp: | Final Temp:              | Initial Temp: | Final Temp:             | Initial Temp: | Final Temp:              | Initial Temp: | Final Temp:             | Initial Temp: | Final Temp:             |
|               | Initial H.R.:         | Initial H.R.:           | Final H.R.: | Initial H.R.: | Final H.R.:              | Initial H.R.: | Final H.R.:             | Initial H.R.: | Final H.R.:              | Initial H.R.: | Final H.R.:             | Initial H.R.: | Final H.R.:             |
|               | Initial Temp:         | Initial Temp:           | Final Temp: | Initial Temp: | Final Temp:              | Initial Temp: | Final Temp:             | Initial Temp: | Final Temp:              | Initial Temp: | Final Temp:             | Initial Temp: | Final Temp:             |
|               | Initial H.R.:         | Initial H.R.:           | Final H.R.: | Initial H.R.: | Final H.R.:              | Initial H.R.: | Final H.R.:             | Initial H.R.: | Final H.R.:              | Initial H.R.: | Final H.R.:             | Initial H.R.: | Final H.R.:             |
|               | Initial Temp:         | Initial Temp:           | Final Temp: | Initial Temp: | Final Temp:              | Initial Temp: | Final Temp:             | Initial Temp: | Final Temp:              | Initial Temp: | Final Temp:             | Initial Temp: | Final Temp:             |
|               | Initial H.R.:         | Initial H.R.:           | Final H.R.: | Initial H.R.: | Final H.R.:              | Initial H.R.: | Final H.R.:             | Initial H.R.: | Final H.R.:              | Initial H.R.: | Final H.R.:             | Initial H.R.: | Final H.R.:             |
|               | Initial Temp:         | Initial Temp:           | Final Temp: | Initial Temp: | Final Temp:              | Initial Temp: | Final Temp:             | Initial Temp: | Final Temp:              | Initial Temp: | Final Temp:             | Initial Temp: | Final Temp:             |
|               | Initial H.R.:         | Initial H.R.:           | Final H.R.: | Initial H.R.: | Final H.R.:              | Initial H.R.: | Final H.R.:             | Initial H.R.: | Final H.R.:              | Initial H.R.: | Final H.R.:             | Initial H.R.: | Final H.R.:             |

**Notes:**

*Completed by:*

Printed Name

Signature

Date



## Appendix B

### Job Safety Analysis (JSA) Documents

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# Job Safety Analysis



## Field Activities

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                              |                                      |                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------|-------------------------------------|
| <b>Project Name:</b><br>Nepera Harriman Site Remediation Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Project Number:</b><br>233099-01.02                       | <b>JSA Number:</b><br>001            | <b>Issue Date:</b><br>10/29/2023    |
| <b>Location:</b><br>Harriman, New York                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Contractor:</b><br>Anchor QEA, LLC                        | <b>Analysis by:</b><br>Pia Tapiawala | <b>Analysis Date:</b><br>10/24/2023 |
| <b>Work Operation:</b><br>Field activities                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Superintendent/Competent Person:</b><br>Stephen Colquhoun | <b>Revised by:</b><br>Pia Tapiawala  | <b>Revised Date:</b><br>10/27/2023  |
| <b>Required Personal Protective Equipment (PPE):</b> <ul style="list-style-type: none"> <li>Modified Level D—Long pants, long sleeves, and steel-toed footwear conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05</li> <li>Depending on activity, the following PPE may also be required: safety glasses/splash goggles, hard hat, nitrile outer gloves and latex inner gloves, and, U.S. Coast Guard-approved personal flotation device (PFD) if working on or within 10 feet of a body of water (PFD; see cold stress section for cold-weather PFD information)</li> </ul> |                                                              | <b>Reviewed by:</b><br>Tim Shaner    | <b>Reviewed Date:</b><br>10/29/2023 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                              | <b>Approved by:</b><br>Sarah LaRoe   | <b>Approved Date:</b><br>10/29/2023 |

| Work Activity              | Potential Hazards       | Preventive or Corrective Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Inspection Requirements                                                                              |
|----------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| Outdoor, physical activity | Slips, trips, and falls | <ul style="list-style-type: none"> <li>Avoid walking while writing or texting—maintain a heads-up posture.</li> <li>Be aware of potentially slippery surfaces and tripping hazards. Use handrails where available. Wear footwear that has sufficient traction.</li> <li>Maintain good housekeeping practices. Clean up all spills immediately.</li> <li>Be aware of weather effects on the work area, including wet and/or frozen ground.</li> <li>Jumping, running, and horseplay are prohibited.</li> <li>Keep all areas clean and free of debris to prevent any trips and falls.</li> <li>Be aware of and limit loose clothing or untied shoelaces that may contribute to slips, trip, and falls.</li> <li>Notify the field team members of any unsafe conditions.</li> </ul> | <ul style="list-style-type: none"> <li>Routinely inspect work area for unsafe conditions.</li> </ul> |

# Job Safety Analysis



## Field Activities

| Work Activity                          | Potential Hazards | Preventive or Corrective Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Inspection Requirements                                                                                                                                                                                                              |
|----------------------------------------|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Outdoor, physical activity (continued) | Heat stress       | <ul style="list-style-type: none"> <li>Adjust work schedules, as necessary, to avoid the hottest part of the day.</li> <li>Take rest breaks as warranted.</li> <li>Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods.</li> <li>Maintain body fluids at normal levels.</li> <li>Train workers to recognize the symptoms of heat-related illness.</li> </ul>                                                                                                                                               | <ul style="list-style-type: none"> <li>Review weather forecast prior to field work.</li> <li>Monitor workers' physical conditions.</li> <li>Monitor outside temperature versus worker activity.</li> </ul>                           |
|                                        | Cold stress       | <ul style="list-style-type: none"> <li>Provide shelter (enclosed, heated environment) to protect personnel during rest periods.</li> <li>Educate workers to recognize the symptoms of frostbite and hypothermia.</li> <li>Use appropriate cold-weather gear, up to and including Mustang-type bib coveralls or jacket/bib combinations.</li> <li>Consider additional precautions if working near water in cold weather.</li> <li>Have a dry change of clothing available.</li> <li>Train workers to recognize the symptoms of cold-related illness.</li> </ul> | <ul style="list-style-type: none"> <li>Review weather forecast prior to field work.</li> <li>Monitor workers' physical conditions and PPE.</li> <li>Monitor outside and water temperature versus worker activity and PPE.</li> </ul> |
|                                        | Rain or snow      | <ul style="list-style-type: none"> <li>Wear appropriate PPE (rain gear).</li> <li>Be aware of slip hazards, puddles, and electrical hazards when working in wet conditions.</li> <li>If extremely cold conditions are forecast, consider additional precautions or postponing work activity.</li> </ul>                                                                                                                                                                                                                                                        | <ul style="list-style-type: none"> <li>Review weather forecast prior to field work.</li> <li>Inspect PPE daily prior to use.</li> <li>Routinely inspect work area for deteriorating conditions.</li> </ul>                           |
|                                        | Sunshine          | <ul style="list-style-type: none"> <li>Have sunscreen available for ultraviolet protection.</li> <li>Have abundant water available to prevent dehydration.</li> <li>Consider wearing wide-brimmed headwear and light-colored, lightweight, sun-blocking clothing.</li> </ul>                                                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>Ensure that sunscreen and water are available.</li> </ul>                                                                                                                                     |
|                                        | Lightning         | <ul style="list-style-type: none"> <li>Do not begin or continue work until lightning subsides for at least 30 minutes. Disconnect and do not use or touch electronic equipment.</li> <li>Immediately head for shore if on the water and lightning is observed. If not able to get to shore, disconnect and do not use or touch the major electronic equipment, including the radio, throughout the duration of the storm.</li> </ul>                                                                                                                           | <ul style="list-style-type: none"> <li>Obtain weather forecast and updates as needed.</li> </ul>                                                                                                                                     |

# Job Safety Analysis



## Field Activities

| Work Activity                          | Potential Hazards                                                                                                           | Preventive or Corrective Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Inspection Requirements                                                                                                                                                                        |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Outdoor, physical activity (continued) | High winds                                                                                                                  | <ul style="list-style-type: none"> <li>Wear goggles or safety glasses if dust or debris are visible.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>Review weather forecast prior to field work.</li> <li>Ensure that goggles or safety glasses are available.</li> </ul>                                   |
|                                        | Biological hazards (flora [e.g., poison ivy and poison oak] and fauna [e.g., ticks, bees, spiders, mosquitoes, and snakes]) | <ul style="list-style-type: none"> <li>Be aware of likely biological hazards in the work area.</li> <li>Wear appropriate clothing (i.e., hat, long-sleeve shirt, long pants, leather gloves, boots, and Tyvek coveralls, as appropriate), and apply insect repellent.</li> <li>Wear hand and arm protection when clearing plants or debris from the work area.</li> <li>Carry a walking stick when moving through tall grass to push the grass down before stepping.</li> <li>Be aware of potential wildlife and defensive behavior (e.g., nesting birds, or animals with young).</li> <li>Be aware of snakes that may reside in wells or well vaults.</li> </ul> | <ul style="list-style-type: none"> <li>Ensure that insect repellent is available.</li> <li>Inspect clothing and skin for insects (e.g., ticks) after working in insect-prone areas.</li> </ul> |
|                                        | Noise exposure                                                                                                              | <ul style="list-style-type: none"> <li>Wear hearing protection in high noise environments or when working around heavy machinery or equipment (action level of 85 decibels averaged over an 8-hour day).</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                               | <ul style="list-style-type: none"> <li>Ensure that hearing protection is available.</li> </ul>                                                                                                 |
| Brush clearing using brush cutters     | Cut from brush cutter (lopper) elements and associated pinch points                                                         | <ul style="list-style-type: none"> <li>Wear protective work gloves and long sleeves when operating the brush cutters and never insert fingers between the cutting elements. If a small branch becomes lodged in the tool, hold the other end of the branch and rotate back and forth to dislodge the branch without placing fingers near the cutting elements.</li> </ul>                                                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>Confirm use of gloves, long sleeves and safety glasses. See also notes from biological hazards above.</li> </ul>                                        |
|                                        | Scrapes from small branches                                                                                                 | <ul style="list-style-type: none"> <li>When using the brush cutters to remove small brush or limbs from bushes or trees (less than 1 inch in diameter), be careful to consider where the branch or brush will fall after being cut. Wearing work gloves and eye protection will address this concern.</li> </ul>                                                                                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>Confirm use of gloves, long sleeves and safety glasses</li> </ul>                                                                                       |
|                                        | Disposal of branches                                                                                                        | <ul style="list-style-type: none"> <li>Use work gloves, long sleeve shirts, and safety glasses to avoid cuts and scrapes while removing brush from the desired area for access</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>Confirm use of gloves, long sleeves and safety glasses</li> </ul>                                                                                       |

## Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).

# Job Safety Analysis



## Field Activities

- If boating is involved, and a professional captained vessel is not in use, boat operators must take the appropriate state or provincial boater safety courses.
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

# Job Safety Analysis



## Groundwater Sampling

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                              |                                      |                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------|-------------------------------------|
| <b>Project Name:</b><br>Nepera Harriman Site Remediation Program                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Project Number:</b><br>233099-01.02                       | <b>JSA Number:</b><br>002            | <b>Issue Date:</b><br>10/29/2023    |
| <b>Location:</b><br>Harriman, New York                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Contractor:</b><br>Anchor QEA, LLC                        | <b>Analysis by:</b><br>Pia Tapiawala | <b>Analysis Date:</b><br>10/24/2023 |
| <b>Work Operation:</b><br>Groundwater sampling                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Superintendent/Competent Person:</b><br>Stephen Colquhoun | <b>Revised by:</b><br>Pia Tapiawala  | <b>Revised Date:</b><br>10/27/2023  |
| <b>Required Personal Protective Equipment (PPE):</b> <ul style="list-style-type: none"> <li>Modified Level D—Long pants, long sleeves, and steel-toed footwear conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05</li> <li>Safety glasses/splash goggles, hard hat, nitrile outer gloves and latex inner gloves, and, U.S. Coast Guard-approved personal floatation device (PFD) if working on or within 10 feet of a body of water (PFD; see cold stress section for cold-weather PFD information)</li> </ul> |                                                              | <b>Reviewed by:</b><br>Tim Shaner    | <b>Reviewed Date:</b><br>10/28/2023 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                              | <b>Approved by:</b><br>Sarah LaRoe   | <b>Approved Date:</b><br>10/29/2023 |

| Work Activity                | Potential Hazards       | Preventive or Corrective Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Inspection Requirements                                                                              |
|------------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| If using glassware           |                         | <ul style="list-style-type: none"> <li>Follow the JSA for handling glassware.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                      |
| Groundwater sample retrieval | Slips, trips, and falls | <ul style="list-style-type: none"> <li>Avoid walking while writing or texting—maintain a heads-up posture.</li> <li>Be aware of potentially slippery surfaces, including boat decks, riprap, muddy or algae-covered rocks, shoreline plants or seaweed, thick mud, and tripping hazards. Use handrails where available. Wear footwear that has sufficient traction.</li> <li>Maintain good housekeeping practices. Clean up all spills immediately.</li> <li>Be aware of weather effects on the work area, including wet and/or frozen ground.</li> <li>Jumping, running, and horseplay are prohibited.</li> <li>Keep all areas clean and free of debris to prevent any trips and falls.</li> <li>Notify the field team members of any unsafe conditions.</li> </ul> | <ul style="list-style-type: none"> <li>Routinely inspect work area for unsafe conditions.</li> </ul> |

# Job Safety Analysis



## Groundwater Sampling

| Work Activity                            | Potential Hazards                                                                                                           | Preventive or Corrective Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Inspection Requirements                                                                                                                                                                                    |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Groundwater sample retrieval (continued) | Ingestion of contaminants, or skin or eye contact with contaminants                                                         | <ul style="list-style-type: none"> <li>Wear appropriate PPE to prevent or reduce exposure.</li> <li>Contact 911 if necessary, and perform cardiopulmonary resuscitation (CPR) if breathing stops.</li> <li>Move the exposed person away from the source of contamination and rinse their mouth. If skin exposure occurs, promptly wash the contaminated skin using soap or mild detergent and water. If eye exposure occurs, rinse the eyes with large amounts of water.</li> <li>Follow decontamination procedures as outlined in the Health and Safety Plan (HASP).</li> </ul> | <ul style="list-style-type: none"> <li>Ensure that decontamination procedures are on hand and are reviewed.</li> <li>Ensure that PPE and rinsing water are available.</li> </ul>                           |
|                                          | Pinch points                                                                                                                | <ul style="list-style-type: none"> <li>Maintain a safe distance from closing mechanisms and moving parts on sampling gear.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                            |
|                                          | Biological hazards (flora [e.g., poison ivy and poison oak] and fauna [e.g., ticks, bees, spiders, mosquitoes, and snakes]) | <ul style="list-style-type: none"> <li>Be aware of likely biological hazards in the work area.</li> <li>Wear appropriate clothing (i.e., hat, long-sleeve shirt, long pants, leather gloves, boots, and Tyvek coveralls, as appropriate), and apply insect repellent.</li> <li>Wear hand and arm protection when clearing plants or debris from the work area.</li> </ul>                                                                                                                                                                                                        | <ul style="list-style-type: none"> <li>Ensure that insect repellent is available.</li> <li>Inspect clothing and skin for insects (e.g., ticks) after working in insect-prone areas.</li> </ul>             |
|                                          | Muscle strain or injuries from improper lifting                                                                             | <ul style="list-style-type: none"> <li>Use proper lifting techniques or ask for assistance with heavy objects, buckets, or other unwieldy equipment.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>Evaluate weight and center of gravity of heavier items prior to lifting or moving.</li> </ul>                                                                       |
|                                          | Noise exposure                                                                                                              | <ul style="list-style-type: none"> <li>Wear hearing protection in high noise environments or when working around heavy machinery or equipment (action level of 85 decibels averaged over an 8-hour day).</li> </ul>                                                                                                                                                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>Ensure that hearing protection is available.</li> </ul>                                                                                                             |
| Working outdoors                         | Heat stress                                                                                                                 | <ul style="list-style-type: none"> <li>Adjust work schedules, as necessary, to avoid the hottest part of the day.</li> <li>Take rest breaks as warranted.</li> <li>Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods.</li> <li>Maintain body fluids at normal levels.</li> <li>Train workers to recognize the symptoms of heat-related illness.</li> </ul>                                                                                                                                                                 | <ul style="list-style-type: none"> <li>Review weather forecast prior to field work.</li> <li>Monitor workers' physical conditions.</li> <li>Monitor outside temperature versus worker activity.</li> </ul> |

# Job Safety Analysis



## Groundwater Sampling

| Work Activity                | Potential Hazards | Preventive or Corrective Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Inspection Requirements                                                                                                                                                                                                                    |
|------------------------------|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                              | Cold stress       | <ul style="list-style-type: none"> <li>• Provide shelter (enclosed, heated environment) to protect personnel during rest periods.</li> <li>• Educate workers to recognize the symptoms of frostbite and hypothermia.</li> <li>• Use appropriate cold-weather gear, up to and including Mustang-type bib coveralls or jacket/bib combinations.</li> <li>• Consider additional precautions if working near water in cold weather.</li> <li>• Have a dry change of clothing available.</li> <li>• Train workers to recognize the symptoms of cold-related illness.</li> </ul> | <ul style="list-style-type: none"> <li>• Review weather forecast prior to field work.</li> <li>• Monitor workers' physical conditions and PPE.</li> <li>• Monitor outside and water temperature versus worker activity and PPE.</li> </ul> |
|                              | Rain or snow      | <ul style="list-style-type: none"> <li>• Wear appropriate PPE (rain gear).</li> <li>• Be aware of slip hazards, puddles, and electrical hazards when working in wet conditions.</li> <li>• If extremely cold conditions are forecast, consider additional precautions or postponing work activity.</li> </ul>                                                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>• Review weather forecast prior to field work.</li> <li>• Inspect PPE daily prior to use.</li> <li>• Routinely inspect work area for deteriorating conditions.</li> </ul>                           |
|                              | Sunshine          | <ul style="list-style-type: none"> <li>• Have sunscreen available for ultraviolet protection.</li> <li>• Have abundant water available to prevent dehydration.</li> <li>• Consider wearing wide-brimmed headwear and light-colored, lightweight, sun-blocking clothing.</li> </ul>                                                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>• Ensure that sunscreen and water are available.</li> </ul>                                                                                                                                         |
|                              | Lightning         | <ul style="list-style-type: none"> <li>• Do not begin or continue work until lightning subsides for at least 30 minutes. Disconnect and do not use or touch electronic equipment.</li> <li>• Immediately head for shore if on the water and lightning is observed. If not able to get to shore, disconnect and do not use or touch the major electronic equipment, including the radio, throughout the duration of the storm.</li> </ul>                                                                                                                                   | <ul style="list-style-type: none"> <li>• Obtain weather forecast and updates as needed.</li> </ul>                                                                                                                                         |
| Working outdoors (continued) | High winds        | <ul style="list-style-type: none"> <li>• Wear goggles or safety glasses if dust or debris are visible.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <ul style="list-style-type: none"> <li>• Review weather forecast prior to field work.</li> <li>• Ensure that goggles or safety glasses are available.</li> </ul>                                                                           |

## Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.



# Job Safety Analysis



## Groundwater Sampling

- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

# Job Safety Analysis



## Sample and Laboratory Glassware Handling

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                              |                                      |                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------|-------------------------------------|
| <b>Project Name:</b><br>Nepera Harriman Site Remediation Program                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Project Number:</b><br>233099-01.02                       | <b>JSA Number:</b><br>003            | <b>Issue Date:</b><br>10/29/2023    |
| <b>Location:</b><br>Harriman, New York                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Contractor:</b><br>Anchor QEA, LLC                        | <b>Analysis by:</b><br>Pia Tapiawala | <b>Analysis Date:</b><br>10/24/2023 |
| <b>Work Operation:</b><br>Sample and laboratory glassware handling                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Superintendent/Competent Person:</b><br>Stephen Colquhoun | <b>Revised by:</b><br>Pia Tapiawala  | <b>Revised Date:</b><br>10/27/2023  |
| <b>Required Personal Protective Equipment (PPE):</b> <ul style="list-style-type: none"> <li>Modified Level D—Long pants, long sleeves, and steel-toed footwear conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05</li> <li>Safety glasses/splash goggles, hard hat, nitrile outer gloves and latex inner gloves, and, U.S. Coast Guard-approved personal floatation device (PFD) if working on or within 10 feet of a body of water (PFD; see cold stress section for cold-weather PFD information)</li> </ul> |                                                              | <b>Reviewed by:</b><br>Tim Shaner    | <b>Reviewed Date:</b><br>10/28/2023 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                              | <b>Approved by:</b><br>Sarah LaRoe   | <b>Approved Date:</b><br>10/29/2023 |

| Work Activity                    | Potential Hazards                              | Preventive or Corrective Measures                                                                                                                                                                                                                                                                                                                                                                                                                        | Inspection Requirements                                                                                                     |
|----------------------------------|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| Transporting and using glassware | Breakage of containers during field activities | <ul style="list-style-type: none"> <li>Use appropriately sized tubs or bottle carriers with dividers to prevent bottle-to-bottle contact during transport.</li> <li>Consider using coated glassware, if practicable.</li> <li>Carry oversize bottles in tubs or bottle carriers using both hands during transfer to the sampling vessel and whenever the vessel is underway.</li> <li>Wear PPE even when handling containers without samples.</li> </ul> | <ul style="list-style-type: none"> <li>Ensure dividers are sufficient and will remain in place during transport.</li> </ul> |

# Job Safety Analysis



## Sample and Laboratory Glassware Handling

| Work Activity                         | Potential Hazards                                                                                              | Preventive or Corrective Measures                                                                                                                                                                                                                                                              | Inspection Requirements                                                                                                              |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
|                                       | Faulty glassware                                                                                               | <ul style="list-style-type: none"> <li>Replace any glassware that is chipped, nicked, or cracked.</li> </ul>                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>Inspect glassware before use.</li> </ul>                                                      |
|                                       | Impact with equipment and other objects                                                                        | <ul style="list-style-type: none"> <li>Use care when loading and unloading sampling equipment.</li> <li>Minimize the handling of individual containers to the extent possible.</li> </ul>                                                                                                      |                                                                                                                                      |
| Filling sample containers             | Over-tightening of bottle lids causing breakage                                                                | <ul style="list-style-type: none"> <li>Avoid use of excessive force to tighten bottle caps (i.e., finger tight).</li> <li>Secure lids with clear tape to prevent opening during transport.</li> </ul>                                                                                          |                                                                                                                                      |
|                                       | Breakage during sample collection                                                                              | <ul style="list-style-type: none"> <li>Place containers in plastic tubs between aliquots to limit contact with hard surfaces.</li> <li>Place containers on a stable and non-slip surface during collection.</li> <li>Use the buddy system as needed to hold bottles during filling.</li> </ul> |                                                                                                                                      |
| Filling sample containers (continued) | Contact with sample preservatives (generally HCL or H <sub>2</sub> SO <sub>4</sub> to lower pH to less than 2) | <ul style="list-style-type: none"> <li>Wear nitrile gloves and protective eyewear to prevent skin and eye contact if a container is damaged.</li> <li>Do not open preserved bottles until necessary.</li> </ul>                                                                                |                                                                                                                                      |
| Packing samples for shipment          | Breakage during packing and shipment                                                                           | <ul style="list-style-type: none"> <li>Use bottle wraps, foam sleeves, or bubble wrap to prevent bottle contact in the cooler.</li> <li>Pack coolers snugly, but do not over pack.</li> </ul>                                                                                                  | <ul style="list-style-type: none"> <li>Ensure glass bottles do not touch to minimize potential breakage during transport.</li> </ul> |

# Job Safety Analysis



## Sample and Laboratory Glassware Handling

### Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including, but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

# Job Safety Analysis



## Investigation-derived Waste Management

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                              |                                      |                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------|-------------------------------------|
| <b>Project Name:</b><br>Nepera Harriman Site Remediation Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Project Number:</b><br>233099-01.02                       | <b>JSA Number:</b><br>004            | <b>Issue Date:</b><br>10/29/2023    |
| <b>Location:</b><br>Harriman, New York                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Contractor:</b><br>Anchor QEA, LLC                        | <b>Analysis by:</b><br>Pia Tapiawala | <b>Analysis Date:</b><br>10/24/2023 |
| <b>Work Operation:</b><br>Investigation-derived waste management                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Superintendent/Competent Person:</b><br>Stephen Colquhoun | <b>Revised by:</b><br>Pia Tapiawala  | <b>Revised Date:</b><br>10/27/2023  |
| <b>Required Personal Protective Equipment (PPE):</b> <ul style="list-style-type: none"> <li>Modified Level D—Long pants, long sleeves, and steel-toed footwear conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05</li> <li>Depending on activity, the following PPE may also be required: safety glasses/splash goggles, hard hat, nitrile outer gloves and latex inner gloves, and, if boating, U.S. Coast Guard-approved personal flotation device (PFD; see cold stress section for cold-weather PFD information).</li> </ul> |                                                              | <b>Reviewed by:</b><br>Tim Shaner    | <b>Reviewed Date:</b><br>10/28/2023 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                              | <b>Approved by:</b><br>Sarah LaRoe   | <b>Approved Date:</b><br>10/29/2023 |

| Work Activity                                                  | Potential Hazards | Preventive or Corrective Measures                                                                                                                                                                                                                                                                                                                                                                                                                   | Inspection Requirements                                                                                                                  |
|----------------------------------------------------------------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Containerizing investigation-derived waste (IDW) at the source | Lifting           | <ul style="list-style-type: none"> <li>Use care when lifting to redistribute IDW from one container (e.g., drums and buckets) to another at the source.</li> <li>Seek assistance if loads are too heavy, or if you are experiencing fatigue.</li> <li>Fill containers only to the degree that will be manageable in the future (e.g., half full) and to limit weight.</li> </ul>                                                                    | <ul style="list-style-type: none"> <li>Inspect containers for competency (i.e., no cracks, and handles in good repair).</li> </ul>       |
|                                                                | Pinch points      | <ul style="list-style-type: none"> <li>Wear hand protection when closing containers.</li> <li>Use the buddy system when affixing drum rings.</li> </ul>                                                                                                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>Inspect drums for rust or sharp edges prior to opening or closing.</li> </ul>                     |
| Relocating or staging IDW containers                           | Lifting           | <ul style="list-style-type: none"> <li>Use task-specific tools whenever possible to move full containers (i.e., hoists, drum caddies or dollies, and vehicles).</li> <li>When task-specific tools are not available, use the buddy system to move containers that are reasonable to lift.</li> <li>Never roll drums or containers holding IDW.</li> <li>Stage containers in areas protected from heavy traffic and weather, if possible.</li> </ul> | <ul style="list-style-type: none"> <li>Ensure tools are in good repair.</li> <li>Assess IDW container weight prior to moving.</li> </ul> |

# Job Safety Analysis



## Investigation-derived Waste Management

| Work Activity                                    | Potential Hazards        | Preventive or Corrective Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Inspection Requirements                                                                                   |
|--------------------------------------------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| Relocating or staging IDW containers (continued) | Pinch points or crushing | <ul style="list-style-type: none"><li>• Use tools to achieve the final arrangement when staging containers—do not place hands on the edges of containers while moving them into place.</li><li>• Stand well clear of containers being moved in case they become dislodged from their handling tool during transport.</li><li>• Do not stack IDW containers, as this poses a risk for container toppling and damage.</li><li>• Place containers on a wooden pallet for easy transfer using a pallet jack, if possible.</li></ul> | <ul style="list-style-type: none"><li>• Inspect drums for evidence of cracks or rust.</li></ul>           |
| IDW management – general                         | Splash                   | <ul style="list-style-type: none"><li>• Wear the required PPE at all times.</li><li>• Use care to minimize splashing or smearing of IDW during handling and containerization.</li></ul>                                                                                                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"><li>• Inspect PPE upon donning and periodically during tasks.</li></ul> |

## Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

# Job Safety Analysis



## Anchor QEA Motor Vehicle Operation

|                                                                                                                                                                                                     |                                                           |                                      |                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|--------------------------------------|-------------------------------------|
| <b>Project Name:</b><br>Nepera Harriman Site Remediation Program                                                                                                                                    | <b>Project Number:</b><br>233099-01.02                    | <b>JSA Number:</b><br>005            | <b>Issue Date:</b><br>10/29/2023    |
| <b>Location:</b><br>Harriman, New York                                                                                                                                                              | <b>Contractor:</b><br>Anchor QEA, LLC                     | <b>Analysis by:</b><br>Pia Tapiawala | <b>Analysis Date:</b><br>10/24/2023 |
| <b>Work Operation:</b><br>Anchor QEA motor vehicle operation                                                                                                                                        | <b>Superintendent/Competent Person:</b><br>Vehicle Driver | <b>Revised by:</b><br>Pia Tapiawala  | <b>Revised Date:</b><br>10/27/2023  |
| <b>Required Personal Protective Equipment (PPE):</b> <ul style="list-style-type: none"> <li>Wear seat belt at all times</li> <li>Make sure that clothing will not interfere with driving</li> </ul> |                                                           | <b>Reviewed by:</b><br>Tim Shaner    | <b>Reviewed Date:</b><br>10/28/2023 |
|                                                                                                                                                                                                     |                                                           | <b>Approved by:</b><br>Sarah LaRoe   | <b>Approved Date:</b><br>10/29/2023 |

| Work Activity                      | Potential Hazards           | Preventive or Corrective Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Inspection Requirements                                                                                                                                                                                            |
|------------------------------------|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Anchor QEA motor vehicle operation | Unfamiliar with the vehicle | <ul style="list-style-type: none"> <li>Allow yourself some time to get familiar with an Anchor QEA vehicle, a rental vehicle, or one not used often.</li> <li>Test the lights, windshield wipers, hazard lights, horn, parking brake, and other important functions.</li> <li>Review the dashboard controls, steering radius, and overhead and side clearances.</li> <li>Allow extra side, front, and back space around the vehicle while driving or parking an unfamiliar vehicle.</li> <li>Adjust mirrors and the seat while the vehicle is in park.</li> <li>Drive slowly in confined locations, as in a parking garage, parking lots, or industrial settings. Confirm adequate clearances by sight before turning or backing up in tight or unfamiliar locations.</li> <li>Use a second person to be a spotter outside the vehicle if needed in tight spaces.</li> </ul> | <ul style="list-style-type: none"> <li>Inspect fluid levels and air pressure in tires, adjust mirrors and seat positions appropriately, monitor the fuel level, and fill up when the fuel level is low.</li> </ul> |

# Job Safety Analysis



## Anchor QEA Motor Vehicle Operation

| Work Activity                                  | Potential Hazards | Preventive or Corrective Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Inspection Requirements                                                                                                                          |
|------------------------------------------------|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                | Speed and braking | <ul style="list-style-type: none"> <li>• Fasten and properly adjust the seat belt.</li> <li>• Obey all posted and designated speed limits.</li> <li>• Radar detectors are prohibited in all company-owned, leased, or rented vehicles.</li> <li>• Reduce travel speed during hazardous conditions (e.g., rain, fog, or snow).</li> <li>• Identify whether your vehicle has Anti-Lock Brakes (ABS). If it does, DO NOT pump the brakes to stop when the vehicle has begun to skid. Apply steady pressure to the brakes. If the vehicle does not have ABS, pump the brakes to stop during slippery conditions.</li> </ul>                                                                                                                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>• Seatbelt</li> <li>• Identify designated speed limits</li> <li>• Determine if vehicle has ABS</li> </ul> |
| Anchor QEA motor vehicle operation (continued) | Distance spacing  | <ul style="list-style-type: none"> <li>• Continually check your rear and side view mirrors.</li> <li>• Use the 3-second rule to keep a safe distance between vehicles.</li> <li>• Increase the 3-second rule as necessary during hazardous travel conditions.</li> <li>• Regularly scan the area you will be entering in the next 10 to 12 seconds.</li> <li>• Always leave yourself an "out" during travel.</li> <li>• When stopping, make sure that you leave enough distance between you and the car in front of you. You should be able to see the rear tires of the vehicle in front when stopped.</li> <li>• Obey the speed limit and traffic regulations.</li> <li>• When at a red light and it turns green, use the "delayed start" technique, by counting to three before you take your foot off the brake.</li> <li>• DO NOT TAILGATE.</li> <li>• Keep headlights (and running lights, if available) on for maximum visibility.</li> </ul> | <ul style="list-style-type: none"> <li>• Seatbelt</li> </ul>                                                                                     |
|                                                | Skids             | <ul style="list-style-type: none"> <li>• If the vehicle has begun to skid out of control, turn the steering wheel in the direction of the skid and re-adjust the wheel, as necessary.</li> <li>• Reduce speed during hazardous travel conditions.</li> <li>• Use 4-wheel drive, if available, when driving vehicles off-road, on steep inclines, or in muddy conditions.</li> <li>• Do not take vehicles off-road if they cannot be operated safely in such conditions.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>• Seatbelt</li> </ul>                                                                                     |



# Job Safety Analysis



## Anchor QEA Motor Vehicle Operation

| Work Activity                                  | Potential Hazards                                                    | Preventive or Corrective Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Inspection Requirements                                                                                                |
|------------------------------------------------|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
|                                                | Blind spots                                                          | <ul style="list-style-type: none"> <li>• Become familiar with any blind spots associated with your vehicle.</li> <li>• Adjust mirrors to give the maximum viewing area.</li> <li>• Use your directional devices to signal all turns and when changing lanes; check rear and side view mirror and glance over your shoulder to check that the lane is clear.</li> <li>• Avoid other driver's blind spots; slow down and let the other vehicle pass.</li> <li>• If parked for an extended period and staying in the vehicle, be sure to inspect the area for changed conditions (e.g., a car that moved in behind you) before leaving.</li> </ul> | <ul style="list-style-type: none"> <li>• Seatbelt</li> <li>• Mirrors</li> </ul>                                        |
|                                                | Backing                                                              | <ul style="list-style-type: none"> <li>• Back into parking spaces upon arrival whenever possible.</li> <li>• Perform a 360-degree walk around the vehicle before backing to identify any new conditions or obstructions.</li> <li>• Use a spotter when backing whenever possible.</li> <li>• Understand hand signals.</li> <li>• Sound the horn prior to backing.</li> <li>• Check the rear and side view mirrors prior to backing.</li> <li>• Back slowly in areas of obstructed vision.</li> <li>• Anticipate others who may be backing out into your pathway and adjust accordingly.</li> </ul>                                              | <ul style="list-style-type: none"> <li>• Seatbelt</li> <li>• Mirrors</li> </ul>                                        |
| Anchor QEA motor vehicle operation (continued) | Distractions (e.g., cell phones, reading maps or directions, eating) | <ul style="list-style-type: none"> <li>• Do not engage in distracted driving—focus on operating the vehicle, and on your surroundings (e.g., road conditions and other drivers).</li> <li>• Obey state or local laws regarding cell phone use, at a minimum.</li> <li>• Certain clients prohibit cell phone use regardless of the state you are operating in—know your client's policy.</li> <li>• Use hands-free devices (not hand-held cellular phones) while driving.</li> <li>• Pull over to the side of the road when making a call or checking directions.</li> </ul>                                                                     | <ul style="list-style-type: none"> <li>• Seatbelt</li> <li>• Hands-free devices connected and ready for use</li> </ul> |
|                                                | Accidents                                                            | <ul style="list-style-type: none"> <li>• In the event of an accident, use the following procedures: <ul style="list-style-type: none"> <li>– Stop, call for medical assistance, notify police, and complete an accident report and submit it to your supervisor.</li> <li>– Notify the Project Manager (PM) and Field Lead (FL).</li> <li>– Complete the appropriate incident investigation reports.</li> <li>– Contact Sara Weiskotten, Operations Liaison, at (857) 445-4987.</li> <li>– Contact Diana Reynolds, Insurance Liaison, at (302) 236-8403.</li> </ul> </li> </ul>                                                                 | <ul style="list-style-type: none"> <li>• Seatbelt</li> </ul>                                                           |
|                                                | Influenced by drugs or alcohol                                       | <ul style="list-style-type: none"> <li>• NEVER DRIVE UNDER THE INFLUENCE OF DRUGS OR ALCOHOL.</li> <li>• Keep in mind that the person in another vehicle may be under the influence of controlled substances, and be prepared for erratic or sudden driving changes on their part.</li> </ul>                                                                                                                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>• Seatbelt</li> </ul>                                                           |

# Job Safety Analysis



## Anchor QEA Motor Vehicle Operation

| Work Activity                                  | Potential Hazards | Preventive or Corrective Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Inspection Requirements                                                            |
|------------------------------------------------|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
|                                                | Driver attitude   | <ul style="list-style-type: none"> <li>Do not operate any vehicle when abnormally tired, temporarily disabled (i.e., injured), or under the influence of drugs or alcohol.</li> <li>Keep an even temper when driving. Do not let the actions of others affect your attitude.</li> <li>Do not allow yourself to become frustrated, rushed, distracted, or drowsy.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <ul style="list-style-type: none"> <li>Seatbelt</li> </ul>                         |
|                                                | Fatigue           | <ul style="list-style-type: none"> <li>Stop and rest if fatigued. Exit the road and enter a safe area. Rest until fully refreshed.</li> <li>Be aware that certain medications (such as cold or allergy medicines) may make you drowsy when driving a vehicle.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <ul style="list-style-type: none"> <li>Seatbelt</li> </ul>                         |
|                                                | Vehicle loading   | <ul style="list-style-type: none"> <li>DO NOT OVERLOAD the vehicle.</li> <li>Secure all equipment and supplies within the body of the vehicle using proper tie-downs.</li> <li>Do not block side view mirrors with the load.</li> <li>Do not transport U.S. Department of Transportation (DOT)-manifested hazardous materials.</li> <li>Dispatch all equipment and personnel with proper forms and identification.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>Seatbelt</li> </ul>                         |
| Anchor QEA motor vehicle operation (continued) | Equipment failure | <ul style="list-style-type: none"> <li>Perform daily inspections of your vehicle.</li> <li>Maintain vehicle safety equipment (e.g., mirrors, alarms, horns, wipers, lights, and brakes).</li> <li>Maintain the vehicle (e.g., tire pressure and fluid levels).</li> <li>Any vehicle with mechanical defects that may endanger the safety of the driver, passengers, or the public shall not be used.</li> <li>Ensure that appropriate safety equipment is in the vehicle. Safety equipment should include a spare tire, jack, first-aid kit, fire extinguisher, and flashlight. Flares and/or reflective triangles should be available in larger trucks.</li> <li>Ensure that the proper documentation is in the vehicle. Documentation should include an operations manual for the vehicle, insurance card, vehicle registration, and accident forms.</li> </ul> | <ul style="list-style-type: none"> <li>Inspect and maintain the vehicle</li> </ul> |

# Job Safety Analysis



## Anchor QEA Motor Vehicle Operation

### Training Requirements:

- All drivers are required to have a valid driver's license, and all vehicles must have appropriate state vehicle registration and inspection stickers. The use of hand-held wireless devices is prohibited while driving any vehicle for business use at any time, for personal use during business hours, and as defined by law.
- **If operating a vehicle or vehicle and trailer with a capacity greater than 10,000 pounds, U.S. Department of Transportation regulations may apply. Contact the PM prior to any travel in this configuration.**
- All assigned employees are required to read, familiarize themselves with the contents of this Job Safety Analysis, and sign the signature page before the operation of an Anchor QEA vehicle, and review it with their supervisor during their daily safety meeting.
- All assigned employees are required to complete annual driver training prior to driving an Anchor QEA vehicle.

# Job Safety Analysis



## Anchor QEA Motor Vehicle Operation

### Vehicle Operation Job Safety Analysis Acknowledgement Form

The Anchor QEA Motor Vehicle Operation Job Safety Analysis must be read, understood, and signed before the operation of any Anchor QEA vehicle. My signature below certifies that I have read and understand the procedures presented in the Anchor QEA Motor Vehicle Operation Job Safety Analysis and have completed annual driver training.

| Date | Name (print) | Signature |
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# Job Safety Analysis



## Anchor QEA Motor Vehicle Operation

| Date | Name (print) | Signature |
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# Job Safety Analysis



## Soil Sampling and Well Installation

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                              |                                      |                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------|-------------------------------------|
| <b>Project Name:</b><br>Nepera Harriman Site Remediation Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Project Number:</b><br>233099-01.02                       | <b>JSA Number:</b><br>006            | <b>Issue Date:</b><br>11/30/2023    |
| <b>Location:</b><br>Harriman, New York                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Contractor:</b><br>Anchor QEA, LLC                        | <b>Analysis by:</b><br>Pia Tapiawala | <b>Analysis Date:</b><br>11/13/2023 |
| <b>Work Operation:</b><br>Soil sampling and well installation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Superintendent/Competent Person:</b><br>Stephen Colquhoun | <b>Revised by:</b><br>Pia Tapiawala  | <b>Revised Date:</b><br>11/13/2023  |
| <b>Required Personal Protective Equipment (PPE):</b> <ul style="list-style-type: none"> <li>Modified Level D—Long pants, long sleeves, and steel-toed footwear conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05</li> <li>Modified Level C – Full Face Respirator to be used based on air monitoring levels presented in table 5-2 of the HASP document.</li> <li>Depending on activity, the following PPE may also be required: safety glasses/splash goggles, hard hat, nitrile outer gloves and latex inner gloves, and, U.S. Coast Guard-approved personal floatation device (PFD) if working on or within 10 feet of a body of water (PFD; see cold stress section for cold-weather PFD information)</li> </ul> |                                                              | <b>Reviewed by:</b><br>Tim Shaner    | <b>Reviewed Date:</b><br>11/27/2023 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                              | <b>Approved by:</b><br>Sarah LaRoe   | <b>Approved Date:</b><br>11/30/2023 |

| Work Activity                      | Potential Hazards       | Preventive or Corrective Measures                                                                                                                                                                                                                                                                                                                                                                                                | Inspection Requirements                                                                                                              |
|------------------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| Health and safety tailgate meeting | General                 | <ul style="list-style-type: none"> <li>Park the vehicle in a safe area where everyone can participate.</li> <li>Review the HASP, especially chemical and site hazards, Job Safety Analyses (JSAs), work activities, access and egress, facility rules (if applicable), and site-specific hospital/emergency care.</li> <li>Determine operation of other on-site workers.</li> <li>Discuss any new or unknown hazards.</li> </ul> | <ul style="list-style-type: none"> <li>Follow the JSA for Motor Vehicle Operation.</li> <li>Complete daily tailgate form.</li> </ul> |
| Review site conditions             | Slips, trips, and falls | <ul style="list-style-type: none"> <li>Ensure drilling areas are free of trip hazards. Be aware of wet and muddy conditions.</li> <li>Remove hazards if possible.</li> </ul>                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>Conduct site walk and inspect work area prior to equipment setup.</li> </ul>                  |
|                                    | Biological hazards      | <ul style="list-style-type: none"> <li>Identify any poisonous plants common to the area.</li> <li>Be aware of snakes, bees, ants, and other stinging insects.</li> </ul>                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>Wear appropriate clothing and bug repellent as necessary.</li> </ul>                          |

# Job Safety Analysis



## Soil Sampling and Well Installation

| Work Activity         | Potential Hazards       | Preventive or Corrective Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Inspection Requirements                                                                                                             |
|-----------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
|                       | Utility damage          | <ul style="list-style-type: none"> <li>Prior to ground disturbance, verify the location of known and suspected utilities.</li> <li>Be observant of pavement repairs indicative of utilities.</li> <li>Require the property owner or client to verify the absence of utilities for all drilling locations.</li> <li>If it appears a utility has not been marked, contact the site Project Manager (PM).</li> </ul>                                                                                                                                                                      | <ul style="list-style-type: none"> <li>Document completion of Utility Clearance.</li> </ul>                                         |
| Set up work area      | Traffic hazards         | <ul style="list-style-type: none"> <li>If working in a trafficked area, secure the work area with reflective cones and park in a safe area.</li> <li>Use a spotter while moving vehicles and equipment.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>Routinely inspect work area for unsafe conditions.</li> </ul>                                |
|                       | Slips, trips, and falls | <ul style="list-style-type: none"> <li>Set up work area with clear walking paths, devoid of tripping hazards.</li> <li>Be aware of potentially slippery surfaces, thick mud, and tripping hazards. Wear footwear that has sufficient traction.</li> <li>Maintain good housekeeping practices. Clean up all spills immediately.</li> <li>Be aware of weather effects on the work area, including wet and/or frozen ground.</li> <li>Keep all areas clean and free of debris to prevent any trips and falls.</li> <li>Notify the field team members of any unsafe conditions.</li> </ul> | <ul style="list-style-type: none"> <li>Routinely inspect work area for unsafe conditions.</li> </ul>                                |
|                       | Ergonomic hazards       | <ul style="list-style-type: none"> <li>Use proper lifting techniques when unloading equipment; lift with legs, avoiding twisting or over-reaching while lifting.</li> <li>Use two or more people to lift when necessary.</li> <li>Wear work gloves to avoid hand injuries.</li> </ul>                                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>Routinely inspect work area for unsafe conditions.</li> </ul>                                |
| Soil sample retrieval | Slips, trips, and falls | <ul style="list-style-type: none"> <li>Be aware of potentially slippery surfaces, thick mud, and tripping hazards. Wear footwear that has sufficient traction.</li> <li>Maintain good housekeeping practices. Clean up all spills immediately.</li> <li>Be aware of weather effects on the work area, including wet and/or frozen ground.</li> <li>Keep all areas clean and free of debris to prevent any trips and falls.</li> <li>Notify the field team members of any unsafe conditions.</li> </ul>                                                                                 | <ul style="list-style-type: none"> <li>Routinely inspect work area for unsafe conditions.</li> </ul>                                |
|                       | Chemical hazards        | <ul style="list-style-type: none"> <li>Wear PPE, including safety glasses and appropriate gloves for the chemical hazard anticipated, when in contact with soil.</li> <li>Decontaminate equipment between drilling locations and soil sample intervals.</li> </ul>                                                                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>Monitor workers' PPE.</li> <li>Routinely inspect work area for unsafe conditions.</li> </ul> |
|                       | Noise exposure          | <ul style="list-style-type: none"> <li>Wear ear plugs or earmuffs when in the vicinity of the drill rig or anywhere where the sound level is above 85 dB.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>Monitor workers' PPE.</li> </ul>                                                             |

# Job Safety Analysis



## Soil Sampling and Well Installation

| Work Activity | Potential Hazards                                                   | Preventive or Corrective Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Inspection Requirements                                                                                                                                                       |
|---------------|---------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               | Inhalation hazards                                                  | <ul style="list-style-type: none"><li>Wet the ground, if necessary, to prevent airborne dust.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <ul style="list-style-type: none"><li>Review air monitoring action levels.</li><li>Monitor workers' PPE.</li></ul>                                                            |
|               | Ingestion of contaminants, or skin or eye contact with contaminants | <ul style="list-style-type: none"><li>Wear appropriate PPE to prevent or reduce exposure.</li><li>Contact 911 if necessary and perform cardiopulmonary resuscitation (CPR) if breathing stops.</li><li>Move the exposed person away from the source of contamination and rinse their mouth. If skin exposure occurs, promptly wash the contaminated skin using soap or mild detergent and water. If eye exposure occurs, rinse the eyes with large amounts of water.</li><li>Follow decontamination procedures as outlined in the Health and Safety Plan (HASP).</li></ul> | <ul style="list-style-type: none"><li>Ensure that decontamination procedures are on hand and are reviewed.</li><li>Ensure that PPE and rinsing water are available.</li></ul> |

### Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including, but not limited to, initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.



# Job Safety Analysis



## Water Sampling

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                              |                                      |                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------|-------------------------------------|
| <b>Project Name:</b><br>Nepera Harriman Site Remediation Program                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Project Number:</b><br>233099-01.02                       | <b>JSA Number:</b><br>007            | <b>Issue Date:</b><br>10/29/2023    |
| <b>Location:</b><br>Harriman, New York                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Contractor:</b><br>Anchor QEA, LLC                        | <b>Analysis by:</b><br>Pia Tapiawala | <b>Analysis Date:</b><br>10/24/2023 |
| <b>Work Operation:</b><br>Water <i>sampling</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Superintendent/Competent Person:</b><br>Stephen Colquhoun | <b>Revised by:</b><br>Pia Tapiawala  | <b>Revised Date:</b><br>10/27/2023  |
| <b>Required Personal Protective Equipment (PPE):</b> <ul style="list-style-type: none"> <li>Modified Level D—Long pants, long sleeves, and steel-toed footwear conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05</li> <li>Safety glasses/splash goggles, hard hat, nitrile outer gloves and latex inner gloves, and, U.S. Coast Guard-approved personal floatation device (PFD) if working on or within 10 feet of a body of water (PFD; see cold stress section for cold-weather PFD information)</li> </ul> |                                                              | <b>Reviewed by:</b><br>Tim Shaner    | <b>Reviewed Date:</b><br>10/28/2023 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                              | <b>Approved by:</b><br>Sarah LaRoe   | <b>Approved Date:</b><br>10/29/2023 |

| Work Activity          | Potential Hazards       | Preventive or Corrective Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Inspection Requirements                                                                              |
|------------------------|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| If using glassware     |                         | <ul style="list-style-type: none"> <li>Follow the JSA for handling glassware.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                      |
| Water sample retrieval | Slips, trips, and falls | <ul style="list-style-type: none"> <li>Avoid walking while writing or texting—maintain a heads-up posture.</li> <li>Be aware of potentially slippery surfaces, including boat decks, riprap, muddy or algae-covered rocks, shoreline plants or seaweed, thick mud, and tripping hazards. Use handrails where available. Wear footwear that has sufficient traction.</li> <li>Maintain good housekeeping practices. Clean up all spills immediately.</li> <li>Be aware of weather effects on the work area, including wet and/or frozen ground.</li> <li>Jumping, running, and horseplay are prohibited.</li> <li>Be cautious when entering or exiting the vessel, and load/unload items onto/off of the pier or shore once boarded.</li> <li>Keep all areas clean and free of debris to prevent any trips and falls.</li> <li>Notify the field team members of any unsafe conditions.</li> </ul> | <ul style="list-style-type: none"> <li>Routinely inspect work area for unsafe conditions.</li> </ul> |

# Job Safety Analysis



## Water Sampling

| Work Activity                         | Potential Hazards                                                   | Preventive or Corrective Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Inspection Requirements                                                                                                                                                           |
|---------------------------------------|---------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Water sample retrieval<br>(continued) | Ingestion of contaminants, or skin or eye contact with contaminants | <ul style="list-style-type: none"><li>• Wear appropriate PPE to prevent or reduce exposure.</li><li>• Contact 911 if necessary, and perform cardiopulmonary resuscitation (CPR) if breathing stops.</li><li>• Move the exposed person away from the source of contamination and rinse their mouth. If skin exposure occurs, promptly wash the contaminated skin using soap or mild detergent and water. If eye exposure occurs, rinse the eyes with large amounts of water.</li><li>• Follow decontamination procedures as outlined in the Health and Safety Plan (HASP).</li></ul> | <ul style="list-style-type: none"><li>• Ensure that decontamination procedures are on hand and are reviewed.</li><li>• Ensure that PPE and rinsing water are available.</li></ul> |
|                                       | Pinch points                                                        | <ul style="list-style-type: none"><li>• If boating, secure any unsecured objects on deck; they may shift quickly in wave, current, or engine acceleration conditions.</li><li>• Maintain a safe distance from closing mechanisms and moving parts on sampling gear.</li><li>• If boating, avoid placing your hands or yourself between the boat and the dock or piles.</li></ul>                                                                                                                                                                                                    |                                                                                                                                                                                   |

# Job Safety Analysis



## Water Sampling

| Work Activity                         | Potential Hazards | Preventive or Corrective Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Inspection Requirements                                                                                                                                                                                                                                                                                                 |
|---------------------------------------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Water sample retrieval<br>(continued) | Wading            | <ul style="list-style-type: none"> <li>• Be aware of potentially slippery surfaces and tripping hazards such as fallen brush, logs, rocks, and other debris. Wear footwear that has sufficient traction.</li> <li>• Be aware of water depth and potential drop-offs.</li> <li>• Be aware of existing and projected river flows.</li> <li>• Wear hip or chest waders as appropriate for traction and to protect against cold water.</li> <li>• Keep an extra set of dry clothes on hand, including socks.</li> <li>• Use a wading staff for balance and to check for obstructions in murky water.</li> <li>• Always wear a PFD equipped with a whistle, even if water looks shallow or slow; drop-offs occur and water is often moving faster than it looks.</li> <li>• Waders should fit the person and not be overly baggy.</li> <li>• A wading belt should always be worn (some waders come equipped with one).</li> <li>• Wear felt and/or studded wading boots.</li> <li>• When water is deeper than knee deep, walk sideways, at an angle, or shuffle your feet when walking and never cross your feet.</li> <li>• Bottom conditions, water conditions, and flow can change and must be considered when determining safe allowable wading depth. Higher flow conditions will reduce the safe allowable wading depth.</li> <li>• Water should be entered from the bank and only from a boat that is anchored or on the bank.</li> <li>• If a boat is being used, all applicable boating H&amp;S procedures should be followed (e.g., throwable safety buoy/line, also called a throw bag).</li> <li>• When entering the water, depth at entry point should be 1 foot or less and the bottom should be visible.</li> <li>• Wading should not be conducted if there is overhanging vegetation, logs, or other obstructions that would prevent standing upright while wading.</li> <li>• If the current makes it difficult to hold your position, stop and cease wading.</li> <li>• Deepest water depth acceptable for wading is to an individual's waist. If water depth increases beyond that point, do not proceed into deeper water. Look for an area with shallower water. If shallower water cannot be found, work must be completed from a boat.</li> </ul> | <ul style="list-style-type: none"> <li>• Inspect work area for tripping hazards visible from streambank.</li> <li>• Inspect waders for leaks.</li> <li>• Check depths and flows before wading.</li> <li>• Ensure that change of dry clothes is available if wading in cold weather or cold-water conditions.</li> </ul> |

# Job Safety Analysis



## Water Sampling

| Work Activity                      | Potential Hazards                                                                                                           | Preventive or Corrective Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Inspection Requirements                                                                                                                                                                                                              |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Water sample retrieval (continued) | Biological hazards (flora [e.g., poison ivy and poison oak] and fauna [e.g., ticks, bees, spiders, mosquitoes, and snakes]) | <ul style="list-style-type: none"> <li>Be aware of likely biological hazards in the work area.</li> <li>Wear appropriate clothing (i.e., hat, long-sleeve shirt, long pants, leather gloves, boots, and Tyvek coveralls, as appropriate), and apply insect repellent.</li> <li>Wear hand and arm protection when clearing plants or debris from the work area.</li> </ul>                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>Ensure that insect repellent is available.</li> <li>Inspect clothing and skin for insects (e.g., ticks) after working in insect-prone areas.</li> </ul>                                       |
|                                    | Muscle strain or injuries from improper lifting                                                                             | <ul style="list-style-type: none"> <li>Use proper lifting techniques or ask for assistance with heavy objects, buckets, or other unwieldy equipment.</li> <li>If boating, avoid carrying objects directly onto or off the boat; rather, load/unload objects while on the boat to/from the pier/shore.</li> </ul>                                                                                                                                                                                                                                               | <ul style="list-style-type: none"> <li>Evaluate weight and center of gravity of heavier items prior to lifting or moving.</li> </ul>                                                                                                 |
|                                    | Noise exposure                                                                                                              | <ul style="list-style-type: none"> <li>Wear hearing protection in high noise environments or when working around heavy machinery or equipment (action level of 85 decibels averaged over an 8-hour day).</li> </ul>                                                                                                                                                                                                                                                                                                                                            | <ul style="list-style-type: none"> <li>Ensure that hearing protection is available.</li> </ul>                                                                                                                                       |
| Working outdoors                   | Heat stress                                                                                                                 | <ul style="list-style-type: none"> <li>Adjust work schedules, as necessary, to avoid the hottest part of the day.</li> <li>Take rest breaks as warranted.</li> <li>Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods.</li> <li>Maintain body fluids at normal levels.</li> <li>Train workers to recognize the symptoms of heat-related illness.</li> </ul>                                                                                                                                               | <ul style="list-style-type: none"> <li>Review weather forecast prior to field work.</li> <li>Monitor workers' physical conditions.</li> <li>Monitor outside temperature versus worker activity.</li> </ul>                           |
|                                    | Cold stress                                                                                                                 | <ul style="list-style-type: none"> <li>Provide shelter (enclosed, heated environment) to protect personnel during rest periods.</li> <li>Educate workers to recognize the symptoms of frostbite and hypothermia.</li> <li>Use appropriate cold-weather gear, up to and including Mustang-type bib coveralls or jacket/bib combinations.</li> <li>Consider additional precautions if working near water in cold weather.</li> <li>Have a dry change of clothing available.</li> <li>Train workers to recognize the symptoms of cold-related illness.</li> </ul> | <ul style="list-style-type: none"> <li>Review weather forecast prior to field work.</li> <li>Monitor workers' physical conditions and PPE.</li> <li>Monitor outside and water temperature versus worker activity and PPE.</li> </ul> |

# Job Safety Analysis



## Water Sampling

| Work Activity                   | Potential Hazards | Preventive or Corrective Measures                                                                                                                                                                                                                                                                                                                                                                                                    | Inspection Requirements                                                                                                                                                                                    |
|---------------------------------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Working outdoors<br>(continued) | Rain or snow      | <ul style="list-style-type: none"> <li>Wear appropriate PPE (rain gear).</li> <li>Be aware of slip hazards, puddles, and electrical hazards when working in wet conditions.</li> <li>If extremely cold conditions are forecast, consider additional precautions or postponing work activity.</li> </ul>                                                                                                                              | <ul style="list-style-type: none"> <li>Review weather forecast prior to field work.</li> <li>Inspect PPE daily prior to use.</li> <li>Routinely inspect work area for deteriorating conditions.</li> </ul> |
|                                 | Sunshine          | <ul style="list-style-type: none"> <li>Have sunscreen available for ultraviolet protection.</li> <li>Have abundant water available to prevent dehydration.</li> <li>Consider wearing wide-brimmed headwear and light-colored, lightweight, sun-blocking clothing.</li> </ul>                                                                                                                                                         | <ul style="list-style-type: none"> <li>Ensure that sunscreen and water are available.</li> </ul>                                                                                                           |
|                                 | Lightning         | <ul style="list-style-type: none"> <li>Do not begin or continue work until lightning subsides for at least 30 minutes. Disconnect and do not use or touch electronic equipment.</li> <li>Immediately head for shore if on the water and lightning is observed. If not able to get to shore, disconnect and do not use or touch the major electronic equipment, including the radio, throughout the duration of the storm.</li> </ul> | <ul style="list-style-type: none"> <li>Obtain weather forecast and updates as needed.</li> </ul>                                                                                                           |
|                                 | High winds        | <ul style="list-style-type: none"> <li>Wear goggles or safety glasses if dust or debris are visible.</li> </ul>                                                                                                                                                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>Review weather forecast prior to field work.</li> <li>Ensure that goggles or safety glasses are available.</li> </ul>                                               |

# Job Safety Analysis



## Water Sampling

### Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- If boating is involved, and a professional captained vessel is not in use, boat operators must take the appropriate state boater safety courses.
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

# Job Safety Analysis



## Drilling Oversight

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                              |                                      |                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------|-------------------------------------|
| <b>Project Name:</b><br>Nepera Harriman Site Remediation Program                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Project Number:</b><br>233099-01.02                       | <b>JSA Number:</b><br>008            | <b>Issue Date:</b><br>10/29/2023    |
| <b>Location:</b><br>Harriman, New York                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Contractor:</b><br>Anchor QEA, LLC                        | <b>Analysis by:</b><br>Pia Tapiawala | <b>Analysis Date:</b><br>10/24/2023 |
| <b>Work Operation:</b><br>Drilling Oversight                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Superintendent/Competent Person:</b><br>Stephen Colquhoun | <b>Revised by:</b><br>Pia Tapiawala  | <b>Revised Date:</b><br>10/27/2023  |
| <b>Required Personal Protective Equipment (PPE):</b> <ul style="list-style-type: none"> <li>Modified Level D—Long pants, long sleeves, and steel-toed footwear conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05</li> <li>Safety glasses/splash goggles, hard hat, nitrile outer gloves and latex inner gloves, and, U.S. Coast Guard-approved personal floatation device (PFD) if working on or within 10 feet of a body of water (PFD; see cold stress section for cold-weather PFD information)</li> </ul> |                                                              | <b>Reviewed by:</b><br>Tim Shaner    | <b>Reviewed Date:</b><br>10/28/2023 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                              | <b>Approved by:</b><br>Sarah LaRoe   | <b>Approved Date:</b><br>10/29/2023 |

| Work Activity       | Potential Hazards                                              | Preventive or Corrective Measures                                                                                                                                                                                                                                                                                                         | Inspection Requirements                                                                                                           |
|---------------------|----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Borehole logging    | Cuts or incisions from opening sample liner with cutting tools | <ul style="list-style-type: none"> <li>If possible, have drilling contractor open plastic sample liners.</li> <li>Wear appropriate PPE including cut resistant gloves.</li> <li>Cut away from body while opening plastic liners.</li> <li>Use correct cutting tools.</li> <li>Use specialized core cutting table if available.</li> </ul> |                                                                                                                                   |
| Drilling Oversight  | Overhead hazards, standing in blind zone, or splash zone       | <ul style="list-style-type: none"> <li>Stand appropriate distance away from active drill site while observing the work.</li> <li>Communicate with driller using hand signals or hand-held devices to avoid being in the driller's blind sight.</li> </ul>                                                                                 |                                                                                                                                   |
| Drilling activities | Muscle strain or injuries from improper lifting                | <ul style="list-style-type: none"> <li>Use proper lifting techniques or ask for assistance with heavy objects.</li> </ul>                                                                                                                                                                                                                 | <ul style="list-style-type: none"> <li>Evaluate weight and center of gravity of heavier items prior to lifting/moving.</li> </ul> |
|                     | Noise exposure                                                 | <ul style="list-style-type: none"> <li>Wear hearing protection in high noise environments or when working around heavy machinery or equipment (action level of 85 decibels averaged over an 8-hour day).</li> </ul>                                                                                                                       | <ul style="list-style-type: none"> <li>Ensure that hearing protection is available.</li> </ul>                                    |

# Job Safety Analysis



## Drilling Oversight

| Work Activity                      | Potential Hazards                    | Preventive or Corrective Measures                                                                                                                                                                                                                                                         | Inspection Requirements                                                                                                                                                                                                                                                    |
|------------------------------------|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Drilling activities<br>(continued) | Rotating and moving equipment        | <ul style="list-style-type: none"> <li>Set up borehole logging station in area well clear of drill rig and drilling activities.</li> <li>Set up borehole logging station in an upwind location, if possible.</li> <li>Stay clear of drill rig while drill rig is in operation.</li> </ul> | <ul style="list-style-type: none"> <li>Get visual contact with driller and ensure driller has shut down rig before approaching drilling work area.</li> <li>Confirm with driller that borehole logging station will not be in a potentially hazardous location.</li> </ul> |
|                                    | Traffic                              | <ul style="list-style-type: none"> <li>Use methods such as cones, signs, lights, and caution tape to divert and slow traffic near work site.</li> </ul>                                                                                                                                   | <ul style="list-style-type: none"> <li>Evaluate work site for traffic hazards before commencing work.</li> </ul>                                                                                                                                                           |
|                                    | Moving support vehicles or forklifts | <ul style="list-style-type: none"> <li>Set up borehole logging station in area well clear of moving vehicles and work zones.</li> </ul>                                                                                                                                                   | <ul style="list-style-type: none"> <li>Confirm with driller that borehole logging station will not be in a potentially hazardous location.</li> </ul>                                                                                                                      |
|                                    | Slips, trips, and falls              | <ul style="list-style-type: none"> <li>Stay clear of drilling contractor work zones, if possible.</li> </ul>                                                                                                                                                                              | <ul style="list-style-type: none"> <li>Inspect ground surface for uneven surfaces or equipment before entering a work area.</li> </ul>                                                                                                                                     |
|                                    | Overhead hazards                     | <ul style="list-style-type: none"> <li>Keep adequate distance between yourself and heavy overhead hazards, such as drill tooling and samplers.</li> <li>Stay clear of drill rig while drill rig is in operation.</li> <li>Wear appropriate PPE.</li> </ul>                                | <ul style="list-style-type: none"> <li>Evaluate cables and connectors for overhead objects.</li> </ul>                                                                                                                                                                     |



# Job Safety Analysis



## Drilling Oversight

### Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including, but not limited to initial 40-hour and annual 8-hour refresher training.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120 (f).
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity.

# Job Safety Analysis



## Wading

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                              |                                     |                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|-------------------------------------|-------------------------------------|
| <b>Project Name:</b><br>Nepera Harriman Site Remediation Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Project Number:</b><br>233099-01.02                       | <b>JSA Number:</b><br>009           | <b>Issue Date:</b><br>10/29/2023    |
| <b>Location:</b><br>Harriman, New York                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Contractor:</b><br>Anchor QEA, LLC                        | <b>Analysis by:</b><br>Sarah LaRoe  | <b>Analysis Date:</b><br>10/19/2023 |
| <b>Work Operation:</b><br>Wading                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Superintendent/Competent Person:</b><br>Stephen Colquhoun | <b>Revised by:</b><br>Pia Tapiawala | <b>Revised Date:</b><br>10/27/2023  |
| <b>Required Personal Protective Equipment (PPE):</b> <ul style="list-style-type: none"> <li>Level D PPE (consider steel toe waders, high-visibility vest, hard hat, safety glasses, nitrile gloves, long pants, hearing protection [if above 85 decibels time-weighted average])</li> <li>U.S. Coast Guard-approved personal floatation device (PFD) if working on or within 10 feet of a body of water</li> <li>Life vests should be equipped with a whistle</li> <li>Chest waders if entering water body with felt or studded wading boots</li> <li>A wading staff</li> </ul> |                                                              | <b>Reviewed by:</b><br>Tim Shaner   | <b>Reviewed Date:</b><br>10/29/2023 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                              | <b>Approved by:</b><br>Sarah LaRoe  | <b>Approved Date:</b><br>10/29/2023 |

| Work Activity             | Potential Hazards       | Preventative or Corrective Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Inspection Requirements                                                                                                                                                                                                                                                                        |
|---------------------------|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Wading in river or stream | Slips, trips, and falls | <ul style="list-style-type: none"> <li>Be aware of potentially slippery surfaces and tripping hazards such as fallen brush, logs, rocks, and other debris. Wear footwear that has sufficient traction.</li> <li>Be aware of the water depth and potential drop-offs.</li> <li>Be aware of existing and projected river flows.</li> <li>Wear hip or chest waders as appropriate for traction and to protect against cold water.</li> <li>Keep an extra set of dry clothes on hand, including socks.</li> <li>Use a wading staff for balance and to check for obstructions in murky water.</li> <li>Always wear a PFD, even if water looks shallow or slow; drop-offs occur, and water is often moving faster than it looks.</li> <li>Waders should fit the person and not be overly baggy.</li> <li>A wading belt should always be worn (some waders come equipped with one).</li> <li>Wear felt and/or studded wading boots.</li> </ul> | <ul style="list-style-type: none"> <li>Inspect work area for tripping hazards visible from streambank.</li> <li>Inspect waders for leaks.</li> <li>Check depths and flows before wading.</li> <li>Inspect PFDs for integrity, particularly the cartridge charge on inflatable PFDs.</li> </ul> |

# Job Safety Analysis



## Wading

| Work Activity                            | Potential Hazards                      | Preventative or Corrective Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Inspection Requirements |
|------------------------------------------|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| Wading in river or stream<br>(continued) | Slips, trips, and falls<br>(continued) | <ul style="list-style-type: none"><li>• When water is deeper than knee deep, walk sideways, at an angle, or shuffle your feet when walking and never cross your feet.</li><li>• Bottom conditions, water conditions, and flow can change and must be considered when determining safe allowable wading depth. Higher flow conditions will reduce the safe allowable wading depth.</li><li>• Water should be entered from the bank and only from a boat that is anchored or on the bank.</li><li>• If a boat is being used, all applicable boating H&amp;S procedures should be followed (e.g., throwable safety buoy/line, also called a throw bag).</li><li>• When entering the water, depth at entry point should be 1 foot or less and the bottom should be visible.</li><li>• Wading should not be conducted if there is overhanging vegetation, logs, or other obstructions that would prevent standing upright while wading.</li><li>• If the current makes it difficult to hold your position, stop and cease wading.</li><li>• Deepest water depth acceptable for wading is to an individual's waist. If water depth increases beyond that point, do not proceed into deeper water. Look for an area with shallower water. If shallower water cannot be found, work must be completed from a boat.</li></ul> |                         |

## Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including but not limited to initial 40-hour and annual 8-hour refresher training.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120 (f).
- All assigned employees are required to familiarize themselves with the contents of this Job Safety Analysis before starting a work activity.

# Job Safety Analysis



## Nitrogen Cylinder Safety

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                              |                                      |                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------|-------------------------------------|
| <b>Project Name:</b><br>Nepera Harriman Site Remediation Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Project Number:</b><br>233099-01.02                       | <b>JSA Number:</b><br>010            | <b>Issue Date:</b><br>11/30/2023    |
| <b>Location:</b><br>Harriman, NY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Contractor:</b><br>Anchor QEA, LLC                        | <b>Analysis by:</b><br>Pia Tapiawala | <b>Analysis Date:</b><br>11/28/2023 |
| <b>Work Operation:</b><br>Nitrogen Cylinder Safety                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Superintendent/Competent Person:</b><br>Stephen Colquhoun | <b>Revised by:</b><br>Sarah LaRoe    | <b>Revised Date:</b><br>11/28/2023  |
| <b>Required Personal Protective Equipment (PPE):</b> <ul style="list-style-type: none"> <li>Modified Level D—Long pants, long sleeves, and steel-toed footwear conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05</li> <li>For this activity, the following PPE may also be required: work gloves for handling nitrogen gas cylinders, safety glasses/splash goggles, hard hat, nitrile outer gloves and latex inner gloves, and U.S. Coast Guard-approved personal floatation device (PFD) if within 10 feet of a body of water (PFD; see cold stress section for cold-weather PFD information)</li> </ul> |                                                              | <b>Reviewed by:</b><br>Tim Shaner    | <b>Reviewed Date:</b><br>11/29/2023 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                              | <b>Approved by:</b><br>Sarah LaRoe   | <b>Approved Date:</b><br>11/30/2023 |

| Work Activity                | Potential Hazards                   | Preventive or Corrective Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Inspection Requirements                                                                                                                                                             |
|------------------------------|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| General cylinder precautions | Damage to cylinders/injury to staff | <ul style="list-style-type: none"> <li>Do not use cylinders as rollers, supports, or for any purpose other than to contain and use the contents as received.</li> <li>Do not place cylinders in a location where might become part of an electrical circuit.</li> <li>Do not expose the cylinders to temperature extremes.</li> <li>Leaking or defective cylinders will be moved to an isolated, well-ventilated area, away from ignition sources.</li> <li>When a cylinder or valve is noticeably corroded, dented, cut, damaged, or involved in an accident (e.g., dropped, struck), notify the gas supplier and follow their instructions.</li> <li>Do not allow compressed gas streams to be directed toward any person.</li> <li>Transfer of compressed gases from one cylinder to another will only be performed by the gas supplier or other trained and qualified personnel.</li> <li>Protective caps will be kept in place during handling and storage activities, regardless if the cylinder is full or empty.</li> <li>Compressed gas will not be used to dust off clothing.</li> </ul> | <ul style="list-style-type: none"> <li>Use soapy water to detect any suspected cylinder and/or valve leaks.</li> <li>Contact the gas supplier if any leaks are detected.</li> </ul> |

# Job Safety Analysis



## Nitrogen Cylinder Safety

| Work Activity               | Potential Hazards                    | Preventive or Corrective Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Inspection Requirements                                                                                                                                                                                                    |
|-----------------------------|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Handling Nitrogen Cylinders | Damage to cylinder / Injury to staff | <ul style="list-style-type: none"> <li>• Never accept a cylinder if the contents are not clearly identified.</li> <li>• Do not rely on color coding to identify the contents of a cylinder.</li> <li>• Remove pressure regulators prior to cylinder movement.</li> <li>• Valve protection caps must be in place and secure when moving.</li> <li>• Make sure cylinder contents are clearly labeled.</li> <li>• If the labeling of a cylinder becomes defaced to the point that the contents cannot be positively identified, the cylinder should be marked "contents unknown" and returned directly to the supplier.</li> <li>• Make sure cylinder valve is fully closed prior to moving.</li> <li>• Utilize cylinder dollies, carts, or other appropriate mechanical means to move cylinders.</li> <li>• Never hand carry, slide, drag or roll cylinders.</li> <li>• Do not use ropes, chains, or slings to move cylinders unless equipped with appropriate lifting attachments, such as lugs.</li> <li>• Never lift or pull cylinders by the valve, protective cap, or pressure gauge.</li> <li>• Never drop cylinders or allow things to bang into them.</li> <li>• Cylinders are to be placed on flat floors, ground, or platforms.</li> <li>• Cylinder containing nitrogen, oxygen or combustible gases will not be taken in confined spaces.</li> <li>• Venting of tanks after completion of work should be done outdoors and downwind of the breathing zone.</li> </ul> | <ul style="list-style-type: none"> <li>• Verify protection caps are in place.</li> <li>• All markings and labels are in place.</li> <li>• Dollies and carts are in good condition.</li> <li>• Location is flat.</li> </ul> |

# Job Safety Analysis



## Nitrogen Cylinder Safety

| Work Activity                   | Potential Hazards                          | Preventive or Corrective Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Inspection Requirements                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Transporting Nitrogen Cylinders | Violation of regulations / Injury to staff | <ul style="list-style-type: none"> <li>49 CFR Section 173.6 allows for use of the Materials of Trade exemption for transport provided the cylinders do not exceed the combined gross weight of 200kg (440 lbs).</li> <li>Cylinders cannot exceed 100 kg (220 lbs) individually.</li> <li>The operator for the motor vehicle must be informed of the presence of the hazardous material (including if the package contains a reportable quantity) and must be informed about the requirements of 49 CFR Section 173.6.</li> <li>The operator of the motor vehicle must know the quantity limitations.</li> <li>Packaging, marking, and labeling requirements must be followed.</li> <li>Cylinders must conform to the Hazard Materials Regulation except that outer packaging is not required.</li> <li>Cylinders must be marked with proper shipping name, identification number, and hazard class warning label.</li> <li>Cylinders must be in date by verifying date stamped on cylinder.</li> <li>Limit the number and size of cylinders being transported.</li> <li>Valve protection caps must be in place and secure.</li> <li>Cylinders are to be transported upright.</li> <li>Secure cylinders to prevent movement during transport (web straps rated at 10,000 lbs).</li> <li>Secure cylinders to vehicle to prevent movement during transport.</li> <li>A Safety Data Sheet is to be transported with the cylinders and should be maintained by the operator of the motor vehicle.</li> </ul> | <ul style="list-style-type: none"> <li>Total cylinder weight is less than 200 kg.</li> <li>Each cylinder is less than 100 kg.</li> <li>Operator is aware of requirements.</li> <li>Verify cylinder is in date.</li> <li>Valve protection caps are in place.</li> <li>Securement straps are in good condition and rated for at least 10,000 lbs.</li> <li>Cylinders are secured in place.</li> <li>SDS is with the vehicle.</li> </ul> |
| Storage of Nitrogen Cylinders   | Damage to cylinder / Injury to staff       | <ul style="list-style-type: none"> <li>Secure them to an immovable object capable of holding the weight in an upright position using a sturdy chain or strap.</li> <li>Valve protection caps must be in place.</li> <li>Store in a dry, well-ventilated, clearly marked area at least 20 feet from heat sources and combustible material, other gases, and electrical equipment.</li> <li>If storing on the ground more than a few days, insulated them from the ground to protect from water damage and corrosion.</li> <li>Always insulate from the ground, as necessary, to protect from freezing and extreme temperatures.</li> <li>Store where temperature will not exceed 125°F (52°C).</li> <li>Store full and empty cylinders separately.</li> <li>Cylinders are to be placed on flat floors, ground, or platforms.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>Cylinders are secure.</li> <li>Valve protection caps are in place.</li> <li>Cylinders are properly insulated from the ground.</li> <li>Temperature is less than 125°F.</li> </ul>                                                                                                                                                                                                              |

# Job Safety Analysis



## Nitrogen Cylinder Safety

|                          |                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                     |
|--------------------------|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Using Nitrogen Cylinders | Damage to cylinder / Injury to staff | <ul style="list-style-type: none"> <li>• Review current SDS prior to using cylinder and follow all requirements/guidance in that document.</li> <li>• Visually inspect cylinders prior to each use for signs of damage or corrosion.</li> <li>• Ensure that pressure relief devices, pressure regulators, and valve cap threads are free of contaminants (e.g., oil, grease, dirt, and solvents) before making connections to the cylinder.</li> <li>• Check that fittings are compatible before attempting to make connections. Different types of cylinders use different threads; do not force on incompatible connections.</li> <li>• Cylinder valve caps will not be forcibly removed. If a cylinder cap cannot be removed by hand pressure, the cylinder will be tagged "Do Not Use" and returned to the gas supplier.</li> <li>• Use an air monitor capable of monitoring O<sub>2</sub> in the breathing zone.</li> <li>• Only use outdoors and remain upwind to prevent exclusion of oxygen from the breathing zone.</li> <li>• Wear chemical resistant gloves rated for nitrogen gas and long sleeves when contact with nitrogen is possible.</li> <li>• Cylinders must be secured to an immovable object capable of holding the weight in an upright position using a sturdy chain or strap, prior to removal of their valve cap. It is also acceptable to secure them to a cart designed for this purpose.</li> <li>• Pressure relief and regulating devices will be inspected prior to each use. If found to be damaged or defective in any way, their use will be discontinued. Modification, alteration, and repair of all regulators and pressure relief devices will be done by qualified personnel.</li> <li>• Use only in locations with sufficient flow velocity to maintain an adequate supply of air in the worker's breathing zone.</li> <li>• Slowly open valves with the cylinder outlet pointed away from personnel. If valve is hard to open, close, and do not use cylinder.</li> <li>• Ensure the cylinder valve is fully open when in use.</li> <li>• Keep gas cylinder valve closed, except when the cylinder is in active use.</li> <li>• Do not apply a flame or localized heat directly to any part of the cylinder.</li> <li>• Ensure that all components used with the nitrogen are compatible with the gas.</li> <li>• Hoses and connections will be inspected regularly for damage. Connections that do not fit will not be forced.</li> <li>• Before a pressure regulator is removed from a cylinder, the cylinder valve will be closed, and the regulator drained of gas pressure.</li> </ul> | <ul style="list-style-type: none"> <li>• Current SDS is reviewed.</li> <li>• PPE is in place and utilized.</li> <li>• Cylinders are secure.</li> <li>• All components used are compatible with nitrogen.</li> </ul> |
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# Job Safety Analysis



## Nitrogen Cylinder Safety

### Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.
- Review of current SDS from supplier that is supplying the cylinders.

### References

<https://www.usasafety.com/news/how-to-transport-gas-cylinders-safely>

<https://connect2local.com/l/465059/c/5069553/a-guide-to-storing-nitrogen-cylinders-at-home>

Linde Nitrogen, compressed Safety Data Sheet P-4631 Issued: 01/01/1980 Revised: 02/03/2022

### Nitrogen Cylinder Safety Job Safety Analysis Acknowledgement Form

The Anchor QEA Nitrogen Cylinder Job Safety Analysis must be read, understood, and signed before performing work. My signature below certifies that I have read and understand the procedures presented in the Anchor QEA Nitrogen Cylinder Safety Job Safety Analysis and will review an up-to-date Safety Data Sheet prior to performing tasks.

| Date | Name (print) | Signature |
|------|--------------|-----------|
|      |              |           |
|      |              |           |



# Job Safety Analysis



## Nitrogen Cylinder Safety

| Date | Name (print) | Signature |
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# Job Safety Analysis



## Nitrogen Cylinder Safety

| Date | Name (print) | Signature |
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# Job Safety Analysis



## Absorbent Sock Handling

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                              |                                      |                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------|-------------------------------------|
| <b>Project Name:</b><br>Nepera Harriman Site Remediation Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Project Number:</b><br>233099-01.02                       | <b>JSA Number:</b><br>011            | <b>Issue Date:</b><br>11/30/2023    |
| <b>Location:</b><br>Harriman, New York                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Contractor:</b><br>Anchor QEA, LLC                        | <b>Analysis by:</b><br>Pia Tapiawala | <b>Analysis Date:</b><br>11/16/2023 |
| <b>Work Operation:</b><br>Absorbent Sock Removal and Handling                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Superintendent/Competent Person:</b><br>Stephen Colquhoun | <b>Revised by:</b><br>Sarah LaRoe    | <b>Revised Date:</b><br>11/21/2023  |
| <b>Required Personal Protective Equipment (PPE):</b> <ul style="list-style-type: none"> <li>Modified Level D—Long pants, long sleeves, and steel-toed footwear conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05</li> <li>Level C (full face respirator) with a Honeywell Defender Multi-Purpose Cartridge (75SCP100L) when processing and handling adsorbent sock and performing associated decontamination and investigative derived waste tasks.</li> <li>For this activity, the following PPE may also be required: safety glasses/splash goggles, hard hat, nitrile outer gloves and latex inner gloves, and, U.S. Coast Guard-approved personal floatation device (PFD) if within 10 feet of a body of water (PFD; see cold stress section for cold-weather PFD information)</li> </ul> |                                                              | <b>Reviewed by:</b><br>Tim Shaner    | <b>Reviewed Date:</b><br>11/29/2023 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                              | <b>Approved by:</b><br>Sarah LaRoe   | 11/30/2023                          |

| Work Activity          | Potential Hazards       | Preventive or Corrective Measures                                                                                                                                                                                  | Inspection Requirements                                                                                             |
|------------------------|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Review site conditions | Slips, trips, and falls | <ul style="list-style-type: none"> <li>Ensure drilling areas are free of trip hazards. Be aware of wet and muddy conditions.</li> <li>Remove hazards if possible.</li> </ul>                                       | <ul style="list-style-type: none"> <li>Conduct site walk and inspect work area prior to equipment setup.</li> </ul> |
|                        | Biological hazards      | <ul style="list-style-type: none"> <li>Identify any poisonous plants common to the area.</li> <li>Be aware of snakes, bees, ants, and other stinging insects.</li> </ul>                                           | <ul style="list-style-type: none"> <li>Wear appropriate clothing and bug repellent as necessary.</li> </ul>         |
| Set up work area       | Traffic hazards         | <ul style="list-style-type: none"> <li>If working in a trafficked area, secure the work area with reflective cones and park in a safe area.</li> <li>Use a spotter while moving vehicles and equipment.</li> </ul> | <ul style="list-style-type: none"> <li>Routinely inspect work area for unsafe conditions.</li> </ul>                |

# Job Safety Analysis



## Absorbent Sock Handling

| Work Activity           | Potential Hazards                                                                            | Preventive or Corrective Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Inspection Requirements                                                                                                                                                                                                                                                                                                                                        |
|-------------------------|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                         | Slips, trips, and falls                                                                      | <ul style="list-style-type: none"> <li>Set up work area with clear walking paths, devoid of tripping hazards.</li> <li>Be aware of potentially slippery surfaces, thick mud, and tripping hazards. Wear footwear that has sufficient traction.</li> <li>Maintain good housekeeping practices. Clean up all spills immediately.</li> <li>Be aware of weather effects on the work area, including wet and/or frozen ground.</li> <li>Keep all areas clean and free of debris to prevent any trips and falls.</li> <li>Notify the field team members of any unsafe conditions.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>Routinely inspect work area for unsafe conditions.</li> </ul>                                                                                                                                                                                                                                                           |
|                         | Ergonomic hazards                                                                            | <ul style="list-style-type: none"> <li>Use proper lifting techniques when unloading equipment; lift with legs, avoiding twisting or over-reaching while lifting.</li> <li>Use two or more people to lift when necessary.</li> <li>Wear work gloves to avoid hand injuries.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <ul style="list-style-type: none"> <li>Routinely inspect work area for unsafe conditions.</li> </ul>                                                                                                                                                                                                                                                           |
| Absorbent sock handling | Ingestion of contaminants, skin or eye contact with contaminants, inhalation of contaminants | <ul style="list-style-type: none"> <li>Wear PPE in accordance with the HASP.</li> <li>Wear nitrile gloves for hand protection when handling absorbent sock.</li> <li>Carefully remove sock from the well and dispose of it in the appropriate IDW container.</li> <li>Contact 911, as necessary; perform CPR if breathing stops.</li> <li>Move exposed person away from source of contamination, and rinse mouth. If exposure to skin occurs, promptly wash contaminated skin using soap or mild detergent and water. Rinse eyes with large amounts of water.</li> <li>Follow decontamination procedures as outlined in the Health and Safety Plan (HASP).</li> <li>Conduct air monitoring in the breathing zone - a hemispheric area forward of the shoulders within a 6-to-9-inch radius of a worker's nose and mouth<sup>1</sup></li> <li>Do not place contaminated sock on clean ground. If needed utilize disposal waste bags to hold used absorbent sock.</li> <li>Use care to minimize splashing or smearing of IDW during handling and containerization.</li> </ul> | <ul style="list-style-type: none"> <li>Inspect PPE upon donning and periodically during tasks.</li> <li>Ensure that decontamination procedures are on hand and are reviewed.</li> <li>Ensure that PPE and rinsing water are available.</li> <li>Conduct for check for proper fit of respirator prior to processing and handling Site-related cores.</li> </ul> |

# Job Safety Analysis



## Absorbent Sock Handling

### Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

## Appendix C

### Safety Data Sheets (SDS)

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## SAFETY DATA SHEET

Version 6.6  
Revision Date 10/27/2021  
Print Date 08/12/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : 2-Aminopyridine

Product Number : A77997  
Brand : Aldrich  
CAS-No. : 504-29-0

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

Company : Sigma-Aldrich 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 1A), H314  
Serious eye damage (Category 1), H318  
Short-term (acute) aquatic hazard (Category 3), H402  
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

Aldrich - A77997

Page 1 of 10

|                            |                                                                                                                                                                            |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hazard statement(s)        |                                                                                                                                                                            |
| H301 + H311                | Toxic if swallowed or in contact with skin.                                                                                                                                |
| H314                       | Causes severe skin burns and eye damage.                                                                                                                                   |
| H412                       | Harmful 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.                                                                                                                      |
| 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         | : 2-Pyridylamine<br>2-Pyridinamine<br>2-AP     |
| Formula          | : C <sub>5</sub> H <sub>6</sub> N <sub>2</sub> |
| Molecular weight | : 94.11 g/mol                                  |
| CAS-No.          | : 504-29-0                                     |
| EC-No.           | : 207-988-4                                    |

| Component              | Classification                                                                                                  | Concentration |
|------------------------|-----------------------------------------------------------------------------------------------------------------|---------------|
| <b>2-aminopyridine</b> |                                                                                                                 |               |
|                        | Acute Tox. 3; Skin Corr. 1A; Eye Dam. 1; Aquatic Acute 3; Aquatic Chronic 3; H301, H311, H314, H318, H402, H412 | <= 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. 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

Nitrogen oxides (NO<sub>x</sub>)

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. 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. 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. 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 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. 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                                                                                   |
|-----------------|----------|-------|--------------------------------|-----------------------------------------------------------------------------------------|
| 2-aminopyridine | 504-29-0 | TWA   | 0.5 ppm                        | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|                 |          | TWA   | 0.5 ppm<br>2 mg/m <sup>3</sup> | USA. NIOSH Recommended Exposure Limits                                                  |
|                 |          | TWA   | 0.5 ppm<br>2 mg/m <sup>3</sup> | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|                 |          | TWA   | 0.5 ppm<br>2 mg/m <sup>3</sup> | USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000                           |
|                 |          | PEL   | 0.5 ppm<br>2 mg/m <sup>3</sup> | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |

## 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: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: KCL 741 Dermatrill® L

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: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: KCL 741 Dermatrill® L

#### Body Protection

Flame retardant antistatic 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: crystalline<br>Color: light yellow              |
| b) Odor                                         | No data available                                     |
| c) Odor Threshold                               | No data available                                     |
| d) pH                                           | No data available                                     |
| e) Melting point/freezing point                 | Melting point/range: 54 - 58 °C (129 - 136 °F) - lit. |
| f) Initial boiling point and boiling range      | 204 - 210 °C 399 - 410 °F - lit.                      |
| g) Flash point                                  | 92 °C (198 °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) Density                                      | 1.065 g/cm <sup>3</sup> at 20 °C (68 °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                         | none                                                  |

**9.2 Other safety information**

No data available

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

Forms explosive mixtures with air on intense heating.

A range from approx. 15 Kelvin below the flash point is to be rated as critical.

The following applies in general to flammable organic substances and mixtures: in correspondingly fine distribution, when whirled up a dust explosion potential may generally be assumed.

### 10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

### 10.3 Possibility of hazardous reactions

Violent reactions possible with:

Strong oxidizing agents  
acids

### 10.4 Conditions to avoid

Strong heating.

### 10.5 Incompatible materials

various plastics, Metals

### 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 - 200 mg/kg

Inhalation: No data available

LD50 Dermal - Guinea pig - 500 mg/kg

No data available

#### Skin corrosion/irritation

Skin - Rabbit

(OECD Test Guideline 404)

#### Serious eye damage/eye irritation

Eyes - chicken

(OECD Test Guideline 438)

#### 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

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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: US1575000

May cause convulsions.

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 - Oryzias latipes - 11 mg/l - 96 h  
(OECD Test Guideline 203)

Toxicity to daphnia and other aquatic invertebrates                      Immobilization EC50 - Daphnia magna (Water flea) - 35 mg/l - 48 h  
(OECD Test Guideline 202)

EC50 - Tetrahymen pyriformis - 393 mg/l - 60 h  
Remarks: (ECOTOX Database)

Toxicity to algae                      ErC50 - Pseudokirchneriella subcapitata - 12 mg/l - 72 h  
(OECD Test Guideline 201)

NOEC - Pseudokirchneriella subcapitata - 2.1 mg/l - 72 h  
(OECD Test Guideline 201)

**12.2 Persistence and degradability**

Biodegradability                      aerobic - Exposure time 28 d  
Result: 9.2 % - Not readily biodegradable.  
(OECD Test Guideline 301F)

**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 Endocrine disrupting properties

No data available

## 12.7 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: 2671    Class: 6.1    Packing group: II  
Proper shipping name: Aminopyridines  
Reportable Quantity (RQ):  
Poison Inhalation Hazard: No

#### IMDG

UN number: 2671    Class: 6.1    Packing group: II    EMS-No: F-A, S-A  
Proper shipping name: AMINOPYRIDINES (o-, m-, p-)

#### IATA

UN number: 2671    Class: 6.1    Packing group: II  
Proper shipping name: Aminopyridines

---

## SECTION 15: Regulatory information

#### SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

#### SARA 313 Components

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

#### SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

#### Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

---

## 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: 6.6

Revision Date: 10/27/2021

Print Date: 08/12/2023



## SAFETY DATA SHEET

Version 6.5  
Revision Date 03/18/2023  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : 2-Butanone

Product Number : 360473

Brand : SIGALD

Index-No. : 606-002-00-3

CAS-No. : 78-93-3

**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)**

Flammable liquids (Category 2), H225

Eye irritation (Category 2A), H319

Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336

For the full text of the H-Statements mentioned in this Section, see Section 16.

**2.2 GHS Label elements, including precautionary statements**

Pictogram



Signal Word

Danger

|                            |                                                                                                                                  |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Hazard statement(s)        |                                                                                                                                  |
| H225                       | Highly flammable liquid and vapor.                                                                                               |
| H319                       | Causes serious eye irritation.                                                                                                   |
| H336                       | May cause drowsiness or dizziness.                                                                                               |
| Precautionary statement(s) |                                                                                                                                  |
| P210                       | Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.                                                              |
| P233                       | Keep container tightly closed.                                                                                                   |
| P240                       | Ground/bond container and receiving equipment.                                                                                   |
| P241                       | Use explosion-proof electrical/ ventilating/ lighting/ equipment.                                                                |
| P242                       | Use only non-sparking tools.                                                                                                     |
| P243                       | Take precautionary measures against static discharge.                                                                            |
| P261                       | Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray.                                                                            |
| P264                       | Wash skin thoroughly after handling.                                                                                             |
| P271                       | Use only outdoors or in a well-ventilated area.                                                                                  |
| P280                       | Wear protective gloves/ eye protection/ face protection.                                                                         |
| P303 + P361 + P353         | IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.                             |
| P304 + P340 + P312         | IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.      |
| P305 + P351 + P338         | IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. |
| P337 + P313                | If eye irritation persists: Get medical advice/ attention.                                                                       |
| P370 + P378                | In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.                                             |
| P403 + P233                | Store in a well-ventilated place. Keep container tightly closed.                                                                 |
| P403 + P235                | Store in a well-ventilated place. Keep cool.                                                                                     |
| P405                       | Store locked up.                                                                                                                 |
| P501                       | Dispose of contents/ container to an approved waste disposal plant.                                                              |

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Repeated exposure may cause skin dryness or cracking.

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Synonyms : Methyl ethyl ketone  
MEK  
Ethyl methyl ketone

Formula : C<sub>4</sub>H<sub>8</sub>O  
Molecular weight : 72.11 g/mol  
CAS-No. : 78-93-3  
EC-No. : 201-159-0  
Index-No. : 606-002-00-3

| Component                  | Classification                                           | Concentration |
|----------------------------|----------------------------------------------------------|---------------|
| <b>Ethyl Methyl Ketone</b> |                                                          |               |
|                            | Flam. Liq. 2; Eye Irrit. 2A; STOT SE 3; H225, H319, H336 | <= 100 %      |

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|  |                                                 |  |
|--|-------------------------------------------------|--|
|  | Concentration limits:<br>20 %: STOT SE 3, H336; |  |
|--|-------------------------------------------------|--|

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.

#### **In case of eye contact**

After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

#### **If swallowed**

After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

#### **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

Flash back possible over considerable distance., Container explosion may occur under fire conditions.

Pay attention to flashback.

Vapors are heavier than air and may spread along floors.

Forms explosive mixtures with air at ambient temperatures.

### 5.3 Advice for firefighters

In the event of fire, wear self-contained breathing apparatus.

### 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. Risk of explosion.

### **6.3 Methods and materials for containment and cleaning up**

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent material (e.g. Chemisorb® ). 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 safe handling**

Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

#### **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**

Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.

For precautions see section 2.2.

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

#### **Storage conditions**

Store under inert gas.

Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition.

Hygroscopic. Store under nitrogen.

#### **Storage class**

Storage class (TRGS 510): 3: Flammable liquids

### **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                                                                                   |
|---------------------|---------|-------|----------------------|-----------------------------------------------------------------------------------------|
| Ethyl Methyl Ketone | 78-93-3 | TWA   | 200 ppm              | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|                     |         | STEL  | 300 ppm              | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|                     |         | TWA   | 200 ppm<br>590 mg/m3 | USA. NIOSH Recommended Exposure Limits                                                  |
|                     |         | ST    | 300 ppm<br>885 mg/m3 | USA. NIOSH Recommended Exposure Limits                                                  |
|                     |         | TWA   | 200 ppm<br>590 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|                     |         | PEL   | 200 ppm<br>590 mg/m3 | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|                     |         | STEL  | 300 ppm<br>885 mg/m3 | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |

#### Biological occupational exposure limits

| Component           | CAS-No. | Parameters                                               | Value  | Biological specimen | Basis                                     |
|---------------------|---------|----------------------------------------------------------|--------|---------------------|-------------------------------------------|
| Ethyl Methyl Ketone | 78-93-3 | methyl ethyl ketone                                      | 2 mg/l | Urine               | ACGIH - Biological Exposure Indices (BEI) |
|                     | Remarks | End of shift (As soon as possible after exposure ceases) |        |                     |                                           |

## 8.2 Exposure controls

### Appropriate engineering controls

Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.

### Personal protective equipment

#### Eye/face protection

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

Splash contact

Material: butyl-rubber

Minimum layer thickness: 0.3 mm

Break through time: 292 min

Material tested: Butoject® (KCL 897 / Aldrich Z677647, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the 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.

#### **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. Risk of explosion.

---

## **SECTION 9: Physical and chemical properties**

### **9.1 Information on basic physical and chemical properties**

|                                                 |                                                                     |
|-------------------------------------------------|---------------------------------------------------------------------|
| a) Appearance                                   | Form: liquid, clear<br>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: -87 °C (-125 °F)                                     |
| f) Initial boiling point and boiling range      | 80 °C 176 °F - lit.                                                 |
| g) Flash point                                  | -3 °C (27 °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: 10.1 %(V)<br>Lower explosion limit: 1.8 %(V) |
| k) Vapor pressure                               | 95 hPa at 20 °C (68 °F)                                             |
| l) Vapor density                                | 2.49 - (Air = 1.0)                                                  |
| m) Density                                      | 0.805 g/mL at 25 °C (77 °F) - lit.                                  |
| Relative density                                | No data available                                                   |
| n) Water solubility                             | soluble                                                             |
| o) Partition coefficient: n-octanol/water       | log Pow: 0.3 at 40 °C (104 °F) - Bioaccumulation is not expected.   |
| p) Autoignition                                 | No data available                                                   |

temperature

- |                              |                   |
|------------------------------|-------------------|
| q) Decomposition temperature | No data available |
| r) Viscosity                 | No data available |
| s) Explosive properties      | No data available |
| t) Oxidizing properties      | none              |

## 9.2 Other safety information

Surface tension 24.6 mN/m at 20 °C (68 °F)

Relative vapor density 2.49 - (Air = 1.0)

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

Vapors may form explosive mixture with air.

### 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

Exposure to moisture.  
Warming.

### 10.5 Incompatible materials

Oxidizing agents, Strong reducing 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 - male and female - 2,193 mg/kg  
(OECD Test Guideline 423)

LC50 Inhalation - Mouse - 4 h - 32,000 mg/m<sup>3</sup> - vapor

Remarks: (RTECS)

LD50 Dermal - Rabbit - 6,480 mg/kg

Remarks: (RTECS)

No data available

#### Skin corrosion/irritation

Skin - Rabbit

Result: No skin irritation - 4 h

(OECD Test Guideline 404)

**Serious eye damage/eye irritation**

Eyes - Rabbit

Result: Severe irritations

(OECD Test Guideline 405)

Remarks: (Regulation (EC) No 1272/2008, Annex VI)

**Respiratory or skin sensitization**

Buehler Test - Guinea pig

Result: negative

(OECD Test Guideline 406)

**Germ cell mutagenicity**

Test Type: Ames test

Test system: *S. typhimurium*

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 471

Result: negative

Test Type: Mutagenicity (mammal cell test): chromosome aberration.

Test system: rat hepatocytes

Method: OECD Test Guideline 473

Result: negative

Test Type: In vitro mammalian cell gene mutation test

Test system: mouse lymphoma cells

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 476

Result: negative

Test Type: Micronucleus test

Species: Mouse

Cell type: Bone marrow

Application Route: Intraperitoneal

Method: OECD Test Guideline 474

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**

May cause drowsiness or dizziness.

**Specific target organ toxicity - repeated exposure**

No data available

**Aspiration hazard**

No data available



## 11.2 Additional Information

RTECS: EL6475000

Central nervous system depression, Gastrointestinal disturbance, narcosis

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

Liver - Irregularities - Based on Human Evidence

Liver - Irregularities - Based on Human Evidence

---

## SECTION 12: Ecological information

### 12.1 Toxicity

|                                                     |                                                                                                          |
|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| Toxicity to fish                                    | static test LC50 - Pimephales promelas (fathead minnow) - 2,993 mg/l - 96 h<br>(OECD Test Guideline 203) |
| Toxicity to daphnia and other aquatic invertebrates | static test EC50 - Daphnia magna (Water flea) - 308 mg/l - 48 h<br>(OECD Test Guideline 202)             |
| Toxicity to algae                                   | static test ErC50 - Pseudokirchneriella subcapitata - 1,972 mg/l - 72 h<br>(OECD Test Guideline 201)     |

### 12.2 Persistence and degradability

|                           |                                                                                                     |
|---------------------------|-----------------------------------------------------------------------------------------------------|
| Biodegradability          | aerobic - Exposure time 28 d<br>Result: 98 % - Readily biodegradable.<br>(OECD Test Guideline 301D) |
| Theoretical oxygen demand | 2,440 mg/g<br>Remarks: (Lit.)                                                                       |
| Ratio BOD/ThBOD           | 76 %<br>Remarks: (IUCLID)                                                                           |

### 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 Endocrine disrupting properties

No data available

### 12.7 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: 1193    Class: 3    Packing group: II  
Proper shipping name: Ethyl methyl ketone  
Reportable Quantity (RQ): 5000 lbs  
Reportable Quantity (RQ): 5000 lbs  
Reportable Quantity (RQ): 100 lbs  
Poison Inhalation Hazard: No

#### IMDG

UN number: 1193    Class: 3    Packing group: II EMS-No: F-E, S-D  
Proper shipping name: ETHYL METHYL KETONE

#### IATA

UN number: 1193    Class: 3    Packing group: II  
Proper shipping name: Ethyl methyl ketone

---

## 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, Acute Health Hazard, Chronic Health Hazard

Reportable Quantity :  
D035 lbs  
F005 lbs

#### Massachusetts Right To Know Components

|                     | CAS-No. | Revision Date |
|---------------------|---------|---------------|
| Ethyl Methyl Ketone | 78-93-3 | 1993-02-16    |

#### Pennsylvania Right To Know Components

SIGALD - 360473

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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: 6.5

Revision Date: 03/18/2023

Print Date: 10/07/2023

## SAFETY DATA SHEET

Version 6.6  
Revision Date 05/24/2023  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : 2-Methylnaphthalene ( $\beta$ )

Product Number : M57006  
Brand : Aldrich  
CAS-No. : 91-57-6

**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 4), H302  
Skin irritation (Category 2), H315  
Eye irritation (Category 2A), H319  
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335  
Short-term (acute) aquatic hazard (Category 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

Warning

Hazard statement(s)

H302 Harmful if swallowed.  
H315 Causes skin irritation.  
H319 Causes serious eye irritation.  
H335 May cause respiratory irritation.  
H411 Toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P261 Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray.  
P264 Wash skin thoroughly after handling.  
P270 Do not eat, drink or smoke when using this product.  
P271 Use only outdoors or in a well-ventilated area.  
P273 Avoid release to the environment.  
P280 Wear protective gloves/ eye protection/ face protection.  
P301 + P312 + P330 IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth.  
P302 + P352 IF ON SKIN: Wash with plenty of soap and water.  
P304 + P340 + P312 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.  
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.  
P332 + P313 If skin irritation occurs: Get medical advice/ attention.  
P337 + P313 If eye irritation persists: Get medical advice/ attention.  
P362 Take off contaminated clothing and wash before reuse.  
P391 Collect spillage.  
P403 + P233 Store in a well-ventilated place. Keep container tightly closed.  
P405 Store locked up.  
P501 Dispose of contents/ container to an approved waste disposal plant.

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Formula :  $C_{11}H_{10}$   
Molecular weight : 142.20 g/mol  
CAS-No. : 91-57-6  
EC-No. : 202-078-3

| Component                  | Classification                                                                                                  | Concentration |
|----------------------------|-----------------------------------------------------------------------------------------------------------------|---------------|
| <b>2-methylnaphthalene</b> | Acute Tox. 4; Skin Irrit. 2;<br>Eye Irrit. 2A; STOT SE 3;<br>Aquatic Acute 2; Aquatic<br>Chronic 2; H302, H315, | <= 100 %      |

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|  |                        |  |
|--|------------------------|--|
|  | H319, H335, H401, H411 |  |
|--|------------------------|--|

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.

#### In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

#### In case of eye contact

After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

#### If swallowed

After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

#### Suitable extinguishing media

Water Foam Carbon dioxide (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.

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

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 dry. 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.

#### Storage class

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

| Component           | CAS-No. | Value                                                                    | Control parameters | Basis                                   |
|---------------------|---------|--------------------------------------------------------------------------|--------------------|-----------------------------------------|
| 2-methylnaphthalene | 91-57-6 | TWA                                                                      | 0.5 ppm            | USA. ACGIH Threshold Limit Values (TLV) |
|                     | Remarks | Not classifiable as a human carcinogen<br>Danger of cutaneous absorption |                    |                                         |

## 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

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

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: 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 |

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|                                                 |                                                     |
|-------------------------------------------------|-----------------------------------------------------|
| d) pH                                           | No data available                                   |
| e) Melting point/freezing point                 | Melting point/range: 34 - 36 °C (93 - 97 °F) - lit. |
| f) Initial boiling point and boiling range      | 241 - 242 °C 466 - 468 °F - lit.                    |
| g) Flash point                                  | ( )Not applicable                                   |
| h) Evaporation rate                             | No data available                                   |
| i) Flammability (solid, gas)                    | No data available                                   |
| j) Upper/lower flammability or explosive limits | No data available                                   |
| k) Vapor pressure                               | No data available                                   |
| l) Vapor density                                | No data available                                   |
| m) Density                                      | 1 g/mL at 25 °C (77 °F) - lit.                      |
| 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                         | none                                                |

## 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

Strong oxidizing agents  
acids

Violent reactions possible with:

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#### 10.4 Conditions to avoid

no information available

#### 10.5 Incompatible materials

No data available

#### 10.6 Hazardous decomposition products

In the event of fire: see section 5

---

### SECTION 11: Toxicological information

#### 11.1 Information on toxicological effects

##### Acute toxicity

LD50 Oral - Rat - 1,630 mg/kg

Remarks: (RTECS)

Inhalation: No data available

LD50 Dermal - Rat - male and female - > 2,000 mg/kg  
(OECD Test Guideline 402)

##### Skin corrosion/irritation

Skin - Rabbit

Result: Skin irritation

Remarks: Causes skin irritation.  
(Lit.)

##### Serious eye damage/eye irritation

Eyes - Rabbit

Result: Eye irritation

Remarks: Causes serious eye irritation.  
(Lit.)

##### 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

Inhalation - May cause respiratory irritation. - Lungs

##### Specific target organ toxicity - repeated exposure

No data available

**Aspiration hazard**

No data available

**11.2 Additional Information**

RTECS: QJ9635000

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

After absorption:

Systemic effects:

Headache

Fever

Convulsions

bloody diarrhoea

ataxia (impaired locomotor coordination)

Coma

Damage to:

Liver

Kidney

Lungs

Further data:

Other dangerous properties can not be excluded.

Handle in accordance with good industrial hygiene and safety practice.

---

**SECTION 12: Ecological information****12.1 Toxicity**

|                  |                                                                                             |
|------------------|---------------------------------------------------------------------------------------------|
| Toxicity to fish | LC50 - Oncorhynchus mykiss (rainbow trout) - 1.45 mg/l - 96 h<br>Remarks: (ECOTOX Database) |
|------------------|---------------------------------------------------------------------------------------------|

**12.2 Persistence and degradability**

|                  |                                                                                                                          |
|------------------|--------------------------------------------------------------------------------------------------------------------------|
| Biodegradability | aerobic - Exposure time 28 d<br>Result: 61.9 % - Readily biodegradable.<br>(OECD Test Guideline 301C)<br>Remarks: (Lit.) |
|------------------|--------------------------------------------------------------------------------------------------------------------------|

**12.3 Bioaccumulative potential**

|                 |                                                                                                                              |
|-----------------|------------------------------------------------------------------------------------------------------------------------------|
| Bioaccumulation | Oncorhynchus mykiss (rainbow trout) - 28 d<br>- 0.017 mg/l(2-methylnaphthalene)<br><br>Bioconcentration factor (BCF): 23,500 |
|-----------------|------------------------------------------------------------------------------------------------------------------------------|

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#### 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 Endocrine disrupting properties

No data available

#### 12.7 Other adverse effects

Discharge into the environment must be avoided.

---

### SECTION 13: Disposal considerations

#### 13.1 Waste treatment methods

##### Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See [www.retrologistik.com](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)

Not dangerous goods

#### IMDG

UN number: 3077    Class: 9    Packing group: III    EMS-No: F-A, S-F  
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (2-methylnaphthalene)  
Marine pollutant : yes  
Marine pollutant : no

#### IATA

UN number: 3077    Class: 9    Packing group: III  
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (2-methylnaphthalene)

#### 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. Packages smaller than or equal to 5 kg / L , not dangerous goods of Class 9

---

### SECTION 15: Regulatory information

#### SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

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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

### **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-methylnaphthalene | CAS-No.<br>91-57-6 | Revision Date<br>2010-08-02 |
|---------------------|--------------------|-----------------------------|

### **New Jersey Right To Know Components**

|                     |                    |                             |
|---------------------|--------------------|-----------------------------|
| 2-methylnaphthalene | CAS-No.<br>91-57-6 | Revision Date<br>2010-08-02 |
|---------------------|--------------------|-----------------------------|

---

## **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: 6.6

Revision Date: 05/24/2023

Print Date: 10/07/2023

## SAFETY DATA SHEET

Version 6.6  
Revision Date 08/27/2023  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : 2-Methylpyridine

Product Number : 109835

Brand : Aldrich

Index-No. : 613-036-00-2

CAS-No. : 109-06-8

**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)**

Flammable liquids (Category 3), H226

Acute toxicity, Oral (Category 4), H302

Acute toxicity, Inhalation (Category 4), H332

Acute toxicity, Dermal (Category 3), H311

Skin corrosion (Category 1C), H314

Serious eye damage (Category 1), H318

Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

For the full text of the H-Statements mentioned in this Section, see Section 16.

**2.2 GHS Label elements, including precautionary statements**

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Pictogram



Signal Word

Danger

Hazard statement(s)

H226

Flammable liquid and vapor.

H302 + H332

Harmful if swallowed or if inhaled.

H311

Toxic in contact with skin.

H314

Causes severe skin burns and eye damage.

H335

May cause respiratory irritation.

Precautionary statement(s)

P210

Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.

P233

Keep container tightly closed.

P240

Ground/bond container and receiving equipment.

P241

Use explosion-proof electrical/ ventilating/ lighting/ equipment.

P242

Use only non-sparking tools.

P243

Take precautionary measures against static discharge.

P261

Avoid breathing mist or vapors.

P264

Wash skin thoroughly after handling.

P270

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

P271

Use only outdoors or in a well-ventilated area.

P280

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

P301 + P312 + P330

IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth.

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 + P233

Store in a well-ventilated place. Keep container tightly closed.

P403 + P235

Store in a well-ventilated place. Keep cool.

P405

Store locked up.

P501

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

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

---

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Synonyms : 2-Picoline

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Formula : C<sub>6</sub>H<sub>7</sub>N  
 Molecular weight : 93.13 g/mol  
 CAS-No. : 109-06-8  
 EC-No. : 203-643-7  
 Index-No. : 613-036-00-2

| Component               | Classification                                                                                                                       | Concentration |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>2-methylpyridine</b> |                                                                                                                                      |               |
|                         | Flam. Liq. 3; Acute Tox. 4;<br>Acute Tox. 3; Skin Corr.<br>1C; Eye Dam. 1; STOT SE<br>3; H226, H302, H332,<br>H311, H314, H318, H335 | <= 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. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

#### In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Call a physician immediately.

#### In case of eye contact

After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist. Remove contact lenses.

#### If swallowed

After swallowing: make victim drink water (two glasses at most), avoid vomiting (risk of perforation). Call a physician immediately. Do not attempt to neutralise.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

#### Suitable extinguishing media

Carbon dioxide (CO<sub>2</sub>) Foam 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

Nitrogen oxides (NO<sub>x</sub>)

Combustible.

Vapors are heavier than air and may spread along floors.

Forms explosive mixtures with air at elevated temperatures.

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. Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

---

**SECTION 6: Accidental release measures****6.1 Personal precautions, protective equipment and emergency procedures**

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. 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. Risk of explosion.

**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 safe handling**

Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

**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

Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition. Keep locked up or in an area accessible only to qualified or authorized persons.

### Storage class

Storage class (TRGS 510): 3: Flammable liquids

## 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                                               |
|------------------|----------|-------|--------------------|-----------------------------------------------------|
| 2-methylpyridine | 109-06-8 | TWA   | 2 ppm              | USA. Workplace Environmental Exposure Levels (WEEL) |
|                  | Remarks  | Skin  |                    |                                                     |
|                  |          | STEL  | 5 ppm              | USA. Workplace Environmental Exposure Levels (WEEL) |
|                  |          | 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 EN 16523-1 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: butyl-rubber

Minimum layer thickness: 0.7 mm

Break through time: 60 min

Material tested: Butoject® (KCL 898)

##### Body Protection

Flame retardant antistatic protective clothing.

### Respiratory protection

Recommended Filter type: Filter A (acc. to DIN 3181) for vapours of organic compounds

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer.

These measures have to be properly documented.

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. Risk of explosion.

---

## SECTION 9: Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

|                                                 |                                                                           |
|-------------------------------------------------|---------------------------------------------------------------------------|
| a) Appearance                                   | Form: clear, liquid<br>Color: light yellow                                |
| b) Odor                                         | unpleasant                                                                |
| c) Odor Threshold                               | No data available                                                         |
| d) pH                                           | 8.5 at 100 g/l at 20 °C (68 °F)                                           |
| e) Melting point/freezing point                 | Melting point/range: -70 °C (-94 °F) - lit.                               |
| f) Initial boiling point and boiling range      | 128 - 129 °C 262 - 264 °F - lit.                                          |
| g) Flash point                                  | 29 °C (84 °F) - closed cup                                                |
| h) Evaporation rate                             | No data available                                                         |
| i) Flammability (solid, gas)                    | No data available                                                         |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 8.6 %(V)<br>Lower explosion limit: 1.4 %(V)        |
| k) Vapor pressure                               | 13 hPa at 24.4 °C (75.9 °F)                                               |
| l) Vapor density                                | 3.22 - (Air = 1.0)                                                        |
| m) Density                                      | 0.943 g/cm <sup>3</sup> at 25 °C (77 °F) - lit.                           |
| Relative density                                | No data available                                                         |
| n) Water solubility                             | 10 g/l at 20 °C (68 °F) - completely soluble                              |
| o) Partition coefficient: n-octanol/water       | log Pow: 1.11 at 20 °C (68 °F) - Bioaccumulation is not expected., (ECHA) |
| 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

## 9.2 Other safety information

|                        |                          |
|------------------------|--------------------------|
| Surface tension        | 33 mN/m at 25 °C (77 °F) |
| Dissociation constant  | 5.97 at 20 °C (68 °F)    |
| Relative vapor density | 3.22 - (Air = 1.0)       |

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

Vapor/air-mixtures are explosive at intense warming.

### 10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

### 10.3 Possibility of hazardous reactions

A risk of explosion and/or of toxic gas formation exists with the following substances:

Oxidizing agents  
hydrogen peroxide  
sulfuric acid  
Metals  
acids

### 10.4 Conditions to avoid

Heating.

### 10.5 Incompatible materials

No data available

### 10.6 Hazardous decomposition products

In the event of fire: see section 5

---

## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

#### Acute toxicity

LD50 Oral - Rat - male - > 950 mg/kg

(OECD Test Guideline 401)

LC50 Inhalation - Rat - male and female - 4 h - > 9.4 mg/l - vapor

(OECD Test Guideline 403)

Symptoms: mucosal irritations, Cough, Shortness of breath, Possible damages:, damage of respiratory tract

Inhalation: Irritating to respiratory system.

LD50 Dermal - Rabbit - male and female - > 200 - < 316 mg/kg  
(OECD Test Guideline 402)

#### **Skin corrosion/irritation**

Skin - Rabbit

Result: Corrosive - 4 h

Remarks: (ECHA)

#### **Serious eye damage/eye irritation**

Remarks: Causes serious eye damage.

#### **Respiratory or skin sensitization**

No data available

#### **Germ cell mutagenicity**

Test Type: Ames test

Test system: Salmonella typhimurium

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 471

Result: negative

Test Type: Chromosome aberration test in vitro

Test system: Chinese hamster fibroblasts

Metabolic activation: with and without metabolic activation

Result: negative

Remarks: (ECHA)

Test Type: In vitro mammalian cell gene mutation test

Test system: Chinese hamster fibroblasts

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 476

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**

Inhalation - May cause respiratory irritation. - Respiratory Tract

Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

#### **Specific target organ toxicity - repeated exposure**

No data available

#### **Aspiration hazard**

No data available

### **11.2 Additional Information**

Repeated dose toxicity - Rat - male and female - Oral - 102 Weeks - NOAEL (No observed adverse effect level) - 7 mg/kg - LOAEL (Lowest observed adverse effect level) - 14 mg/kg

Remarks: The value is given in analogy to the following substances: Pyridine

RTECS: TJ4900000

Liver injury may occur., Kidney injury may occur., Cough, Shortness of breath, Headache, Nausea, Vomiting, Gastrointestinal disturbance

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

After absorption of toxic quantities:

CNS disorders

Other dangerous properties can not be excluded.

Handle in accordance with good industrial hygiene and safety practice.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

---

## SECTION 12: Ecological information

### 12.1 Toxicity

|                                                     |                                                                                                                                                                                                             |
|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Toxicity to fish                                    | semi-static test EC50 - Danio rerio (zebra fish) - > 560 - < 1,000 mg/l - 96 h<br>(OECD Test Guideline 203)<br>Remarks: The value is given in analogy to the following substances:<br>3-methylpyridine      |
| Toxicity to daphnia and other aquatic invertebrates | EC50 - Daphnia magna (Water flea) - 320 mg/l - 48 h<br>(OECD Test Guideline 202)<br>Remarks: The value is given in analogy to the following substances:<br>3-methylpyridine                                 |
| Toxicity to algae                                   | static test ErC50 - Pseudokirchneriella subcapitata (green algae) - 320 mg/l - 72 h<br>(OECD Test Guideline 201)<br>Remarks: The value is given in analogy to the following substances:<br>3-methylpyridine |
| Toxicity to bacteria                                | NOEC - activated sludge - 20 mg/l - 28 d<br>Remarks: (ECHA)<br>The value is given in analogy to the following substances: 3-methylpyridine                                                                  |

### 12.2 Persistence and degradability

|                  |                                                                                                     |
|------------------|-----------------------------------------------------------------------------------------------------|
| Biodegradability | aerobic - Exposure time 28 d<br>Result: 85 % - Readily biodegradable.<br>(OECD Test Guideline 301B) |
|------------------|-----------------------------------------------------------------------------------------------------|

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Remarks: The value is given in analogy to the following substances:  
3-methylpyridine

### 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 Endocrine disrupting properties

No data available

### 12.7 Other adverse effects

Discharge into the environment must be avoided.

---

## SECTION 13: Disposal considerations

### 13.1 Waste treatment methods

#### Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

---

## SECTION 14: Transport information

#### DOT (US)

UN number: 2313    Class: 3    Packing group: III  
Proper shipping name: Picolines  
Reportable Quantity (RQ): 5000 lbs  
Poison Inhalation Hazard: No

#### IMDG

UN number: 2313    Class: 3    Packing group: III    EMS-No: F-E, S-D  
Proper shipping name: PICOLINES

#### IATA

UN number: 2313    Class: 3    Packing group: III  
Proper shipping name: Picolines

---

## 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 |
|------------------|----------|---------------|
| 2-methylpyridine | 109-06-8 | 2007-03-01    |

### **SARA 311/312 Hazards**

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

### **Massachusetts Right To Know Components**

|                  | CAS-No.  | Revision Date |
|------------------|----------|---------------|
| 2-methylpyridine | 109-06-8 | 2007-03-01    |

### **Pennsylvania Right To Know Components**

|                  | CAS-No.  | Revision Date |
|------------------|----------|---------------|
| 2-methylpyridine | 109-06-8 | 2007-03-01    |

---

## **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: 6.6

Revision Date: 08/27/2023

Print Date: 10/07/2023



## SAFETY DATA SHEET

Version 8.4  
Revision Date 08/27/2023  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : 3-Methylpyridine

Product Number : P42053  
Brand : Aldrich  
CAS-No. : 108-99-6

**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)**

Flammable liquids (Category 3), H226  
Acute toxicity, Oral (Category 4), H302  
Acute toxicity, Inhalation (Category 3), H331  
Acute toxicity, Dermal (Category 3), H311  
Skin corrosion (Category 1B), H314  
Serious eye damage (Category 1), H318

For the full text of the H-Statements mentioned in this Section, see Section 16.

**2.2 GHS Label elements, including precautionary statements**

Pictogram



Signal Word

Danger

Hazard statement(s)

H226

Flammable liquid and vapor.

H302

Harmful if swallowed.

H311 + H331

Toxic in contact with skin or if inhaled.

H314

Causes severe skin burns and eye damage.

Precautionary statement(s)

P210

Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.

P233

Keep container tightly closed.

P240

Ground/bond container and receiving equipment.

P241

Use explosion-proof electrical/ ventilating/ lighting/ equipment.

P242

Use only non-sparking tools.

P243

Take precautionary measures against static discharge.

P261

Avoid breathing mist or vapors.

P264

Wash skin thoroughly after handling.

P270

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

P271

Use only outdoors or in a well-ventilated area.

P280

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

P301 + P312 + P330

IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth.

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 + P233

Store in a well-ventilated place. Keep container tightly closed.

P403 + P235

Store in a well-ventilated place. Keep cool.

P405

Store locked up.

P501

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

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

---

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Synonyms : 3-Picoline

Formula : C<sub>6</sub>H<sub>7</sub>N

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Molecular weight : 93.13 g/mol  
CAS-No. : 108-99-6  
EC-No. : 203-636-9

| Component               | Classification                                                                                                      | Concentration |
|-------------------------|---------------------------------------------------------------------------------------------------------------------|---------------|
| <b>3-methylpyridine</b> |                                                                                                                     |               |
|                         | Flam. Liq. 3; Acute Tox. 4;<br>Acute Tox. 3; Skin Corr.<br>1B; Eye Dam. 1; H226,<br>H302, H331, H311, H314,<br>H318 | <= 100 %      |

For the full text of the H-Statements mentioned in this Section, see Section 16.

---

## SECTION 4: First aid measures

### 4.1 Description of first-aid measures

#### General advice

First aiders need to protect themselves. Show this material safety data sheet to the doctor in attendance.

#### If inhaled

After inhalation: fresh air. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

#### In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Call a physician immediately.

#### In case of eye contact

After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist. Remove contact lenses.

#### If swallowed

After swallowing: make victim drink water (two glasses at most), avoid vomiting (risk of perforation). Call a physician immediately. Do not attempt to neutralise.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

#### Suitable extinguishing media

Carbon dioxide (CO<sub>2</sub>) Foam Dry powder

#### Unsuitable extinguishing media

For this substance/mixture no limitations of extinguishing agents are given.

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

Carbon oxides

Nitrogen oxides (NO<sub>x</sub>)

Combustible.

Vapors are heavier than air and may spread along floors.

Forms explosive mixtures with air at elevated temperatures.

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. Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

---

## **SECTION 6: Accidental release measures**

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

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. 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. Risk of explosion.

### **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 safe handling**

Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

#### **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**

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Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition. Keep locked up or in an area accessible only to qualified or authorized persons.

hygroscopic

#### **Storage class**

Storage class (TRGS 510): 3: Flammable liquids

### **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                                               |
|------------------|----------|-------|--------------------|-----------------------------------------------------|
| 3-methylpyridine | 108-99-6 | TWA   | 2 ppm              | USA. Workplace Environmental Exposure Levels (WEEL) |
|                  | Remarks  | Skin  |                    |                                                     |
|                  |          | STEL  | 5 ppm              | USA. Workplace Environmental Exposure Levels (WEEL) |
|                  |          | 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 EN 16523-1 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: butyl-rubber

Minimum layer thickness: 0.7 mm

Break through time: 60 min

Material tested: Butoject® (KCL 898)

##### **Body Protection**

Flame retardant antistatic protective clothing.

### Respiratory protection

Recommended Filter type: Filter A (acc. to DIN 3181) for vapours of organic compounds

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer.

These measures have to be properly documented.

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. Risk of explosion.

---

## SECTION 9: Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

|                                                 |                                                 |
|-------------------------------------------------|-------------------------------------------------|
| a) Appearance                                   | Form: clear, liquid<br>Color: light yellow      |
| b) Odor                                         | No data available                               |
| c) Odor Threshold                               | No data available                               |
| d) pH                                           | No data available                               |
| e) Melting point/freezing point                 | Melting point/range: -19 °C (-2 °F) - lit.      |
| f) Initial boiling point and boiling range      | 144 °C 291 °F - lit.                            |
| g) Flash point                                  | 37 °C (99 °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                               | 5.9 hPa at 20 °C (68 °F)                        |
| l) Vapor density                                | 3.22 - (Air = 1.0)                              |
| m) Density                                      | 0.957 g/cm <sup>3</sup> at 25 °C (77 °F) - lit. |
| Relative density                                | No data available                               |
| n) Water solubility                             | soluble                                         |
| o) Partition coefficient: n-octanol/water       | log Pow: 1.2 at 20 °C (68 °F)                   |
| p) Autoignition temperature                     | 488 °C (910 °F) at 1,009 hPa                    |
| q) Decomposition temperature                    | No data available                               |

- r) Viscosity No data available
- s) Explosive properties No data available
- t) Oxidizing properties none

## 9.2 Other safety information

Relative vapor density 3.22 - (Air = 1.0)

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

Vapor/air-mixtures are explosive at intense warming.

### 10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

### 10.3 Possibility of hazardous reactions

A risk of explosion and/or of toxic gas formation exists with the following substances:

Oxidizing agents  
hydrogen peroxide  
sulfuric acid  
Metals  
acids

### 10.4 Conditions to avoid

hygroscopic  
Heating.

### 10.5 Incompatible materials

No data available

### 10.6 Hazardous decomposition products

In the event of fire: see section 5

---

## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

#### Acute toxicity

LD50 Oral - Rat - male - 630 mg/kg  
(OECD Test Guideline 401)  
LC50 Inhalation - Rat - 4 h - > 1300 - < 3300 ppm - vapor

LD50 Dermal - Rabbit - > 800 - < 2,000 mg/kg  
(OECD Test Guideline 402)  
No data available

#### Skin corrosion/irritation

Skin - Rabbit  
Result: Causes burns.

Remarks: (ECHA)

#### **Serious eye damage/eye irritation**

Eyes - Rabbit

Result: Risk of serious damage to eyes.

Remarks: (ECHA)

#### **Respiratory or skin sensitization**

No data available

#### **Germ cell mutagenicity**

Test Type: reverse mutation assay

Test system: *S. typhimurium*

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 471

Result: negative

Test Type: Micronucleus test

Species: Mouse

Application Route: Oral

Method: OECD Test Guideline 474

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**

Corrosive to the respiratory tract.

#### **Specific target organ toxicity - repeated exposure**

No data available

#### **Aspiration hazard**

No data available

### **11.2 Additional Information**

RTECS: TJ5000000

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., Cough, Shortness of breath, Headache, Nausea

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence



---

## SECTION 12: Ecological information

### 12.1 Toxicity

|                                                     |                                                                                                              |
|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| Toxicity to fish                                    | semi-static test LC50 - Brachydanio rerio (zebrafish) - 560 - 1,000 mg/l - 96 h<br>(OECD Test Guideline 203) |
| Toxicity to daphnia and other aquatic invertebrates | EC50 - Daphnia magna (Water flea) - 320 mg/l - 48 h<br>(OECD Test Guideline 202)                             |
| Toxicity to algae                                   | static test EC50 - Selenastrum capricornutum (green algae) - 320 mg/l - 72 h<br>(OECD Test Guideline 201)    |

### 12.2 Persistence and degradability

|                  |                                                                                                                                   |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Biodegradability | aerobic - Exposure time 28 d<br>Result: 85 % - Readily biodegradable.<br>(OECD Test Guideline 301B)<br>Remarks: No data available |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------|

### 12.3 Bioaccumulative potential

|                 |                                                                                                                             |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------|
| Bioaccumulation | Cyprinus carpio (Carp) - 28 d<br>(3-methylpyridine)<br><br>Bioconcentration factor (BCF): 2.6<br>(OECD Test Guideline 305C) |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------|

### 12.4 Mobility in soil

No data available

### 12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

### 12.6 Endocrine disrupting properties

No data available

### 12.7 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.

---

## SECTION 14: Transport information

### DOT (US)

UN number: 2313 Class: 3 Packing group: III  
Proper shipping name: Picolines  
Reportable Quantity (RQ):  
Poison Inhalation Hazard: No

### IMDG

UN number: 2313 Class: 3 Packing group: III EMS-No: F-E, S-D  
Proper shipping name: PICOLINES

### IATA

UN number: 2313 Class: 3 Packing group: III  
Proper shipping name: Picolines

---

## SECTION 15: Regulatory information

### SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

### SARA 313 Components

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

### SARA 311/312 Hazards

Fire Hazard, 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

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: 08/27/2023

Print Date: 10/07/2023

## SAFETY DATA SHEET

Version 6.7  
Revision Date 03/18/2023  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : 1,2-Dichlorobenzene

Product Number : 240664

Brand : Sigma-Aldrich

Index-No. : 602-034-00-7

CAS-No. : 95-50-1

**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)**

Flammable liquids (Category 4), H227

Acute toxicity, Oral (Category 4), H302

Acute toxicity, Inhalation (Category 4), H332

Skin irritation (Category 2), H315

Eye irritation (Category 2A), H319

Skin sensitization (Category 1), H317

Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

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**

Sigma-Aldrich - 240664

Page 1 of 11

Pictogram



Signal Word

Warning

Hazard statement(s)

|             |                                                       |
|-------------|-------------------------------------------------------|
| H227        | Combustible liquid.                                   |
| H302 + H332 | Harmful if swallowed or if inhaled.                   |
| H315        | Causes skin irritation.                               |
| H317        | May cause an allergic skin reaction.                  |
| H319        | Causes serious eye irritation.                        |
| H335        | May cause respiratory irritation.                     |
| H410        | Very toxic to aquatic life with long lasting effects. |

Precautionary statement(s)

|                    |                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------|
| P210               | Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.                                                              |
| P261               | Avoid breathing mist or vapors.                                                                                                  |
| P264               | Wash skin thoroughly after handling.                                                                                             |
| P270               | Do not eat, drink or smoke when using this product.                                                                              |
| P271               | Use only outdoors or in a well-ventilated area.                                                                                  |
| P272               | Contaminated work clothing must not be allowed out of the workplace.                                                             |
| P273               | Avoid release to the environment.                                                                                                |
| P280               | Wear protective gloves/ eye protection/ face protection.                                                                         |
| P301 + P312 + P330 | IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth.                                                      |
| P302 + P352        | IF ON SKIN: Wash with plenty of soap and water.                                                                                  |
| P304 + P340 + P312 | IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.      |
| P305 + P351 + P338 | IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. |
| P333 + P313        | If skin irritation or rash occurs: Get medical advice/ attention.                                                                |
| P337 + P313        | If eye irritation persists: Get medical advice/ attention.                                                                       |
| P362               | Take off contaminated clothing and wash before reuse.                                                                            |
| P370 + P378        | In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.                                             |
| P391               | Collect spillage.                                                                                                                |
| P403 + P233        | Store in a well-ventilated place. Keep container tightly closed.                                                                 |
| P403 + P235        | Store in a well-ventilated place. Keep cool.                                                                                     |
| P405               | Store locked up.                                                                                                                 |
| P501               | Dispose of contents/ container to an approved waste disposal plant.                                                              |

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

---

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

|                  |   |                                               |
|------------------|---|-----------------------------------------------|
| Formula          | : | C <sub>6</sub> H <sub>4</sub> Cl <sub>2</sub> |
| Molecular weight | : | 147.00 g/mol                                  |
| CAS-No.          | : | 95-50-1                                       |
| EC-No.           | : | 202-425-9                                     |

Sigma-Aldrich - 240664

Page 2 of 11

| Component                  | Classification                                                                                                                                                                                                                  | Concentration |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>1,2-Dichlorobenzene</b> |                                                                                                                                                                                                                                 |               |
|                            | Flam. Liq. 4; Acute Tox. 4;<br>Skin Irrit. 2; Eye Irrit. 2A;<br>Skin Sens. 1; STOT SE 3;<br>Aquatic Acute 1; Aquatic<br>Chronic 1; H227, H302,<br>H332, H315, H319, H317,<br>H335, H400, H410<br>M-Factor - Aquatic Acute:<br>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.

#### In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

#### In case of eye contact

After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

#### If swallowed

After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

#### Suitable extinguishing media

Water Foam Carbon dioxide (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.

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. Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

---

## **SECTION 6: Accidental release measures**

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

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. 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 with liquid-absorbent material (e.g. Chemisorb® ). 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 safe handling**

Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

#### **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.

Light sensitive.

### 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                                                                                   |
|---------------------|---------|----------------------------------------|---------------------|-----------------------------------------------------------------------------------------|
| 1,2-Dichlorobenzene | 95-50-1 | TWA                                    | 25 ppm              | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|                     | Remarks | Not classifiable as a human carcinogen |                     |                                                                                         |
|                     |         | STEL                                   | 50 ppm              | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|                     |         | Not classifiable as a human carcinogen |                     |                                                                                         |
|                     |         | C                                      | 50 ppm<br>300 mg/m3 | USA. NIOSH Recommended Exposure Limits                                                  |
|                     |         | C                                      | 50 ppm<br>300 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|                     |         | C                                      | 50 ppm              | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|                     |         | Skin                                   |                     |                                                                                         |
|                     |         | PEL                                    | 25 ppm<br>150 mg/m3 | 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

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: Viton®

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

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: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 30 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, 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, clear<br>Color: colorless, to, light yellow          |
| b) Odor                                         | characteristic                                                     |
| c) Odor Threshold                               | No data available                                                  |
| d) pH                                           | No data available                                                  |
| e) Melting point/freezing point                 | Melting point/range: -18 - -17 °C (-0.40 - 1 °F) - lit.            |
| f) Initial boiling point and boiling range      | 178 - 180 °C 352 - 356 °F - lit.                                   |
| g) Flash point                                  | 66.0 °C (150.8 °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: 9.2 %(V)<br>Lower explosion limit: 2.2 %(V) |
| k) Vapor pressure                               | 2.1 hPa at 35.0 °C (95.0 °F)                                       |
| l) Vapor density                                | No data available                                                  |



|                                           |                                                                           |
|-------------------------------------------|---------------------------------------------------------------------------|
| m) Density                                | 1.306 g/cm <sup>3</sup> at 25 °C (77 °F) - lit.                           |
| Relative density                          | No data available                                                         |
| n) Water solubility                       | ca.0.1558 g/l at 25 °C (77 °F) - partly soluble                           |
| o) Partition coefficient: n-octanol/water | log Pow: 3.43 at 25 °C (77 °F) - Bioaccumulation is not expected., (Lit.) |
| p) Autoignition temperature               | 648.0 °C (1198.4 °F)                                                      |
| q) Decomposition temperature              | No data available                                                         |
| r) Viscosity                              | No data available                                                         |
| s) Explosive properties                   | No data available                                                         |
| t) Oxidizing properties                   | none                                                                      |

## 9.2 Other safety information

|                 |               |
|-----------------|---------------|
| Surface tension | ca.36.61 mN/m |
|-----------------|---------------|

---

## 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  
Alkali metals  
Alkaline earth metals  
Aluminum  
Light metals

### 10.4 Conditions to avoid

Strong heating.

### 10.5 Incompatible materials

Aluminum, rubber, various plastics

### 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 and female - 2,000 mg/kg  
(OECD Test Guideline 401)

Remarks: (Regulation (EC) No 1272/2008, Annex VI)

Acute toxicity estimate Inhalation - 4 h - 11.1 mg/l - vapor

(Expert judgment)

Remarks: (Regulation (EC) No 1272/2008, Annex VI)

LD50 Dermal - Rabbit - > 10,000 mg/kg

Remarks: (RTECS)

#### Skin corrosion/irritation

Skin - Rabbit

Result: Skin irritation - 24 h

(OECD Test Guideline 404)

#### Serious eye damage/eye irritation

Remarks: Causes serious eye irritation.

Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

#### Respiratory or skin sensitization

Local lymph node assay (LLNA) - Mouse

Result: positive

(OECD Test Guideline 429)

#### Germ cell mutagenicity

Test Type: Ames test

Test system: Escherichia coli/Salmonella typhimurium

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 471

Result: negative

Test Type: Mutagenicity (mammal cell test): chromosome aberration.

Test system: lymphocyte

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 473

Result: negative

Test Type: In vitro mammalian cell gene mutation test

Test system: Chinese hamster ovary cells

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 476

Result: negative

Test Type: In vivo micronucleus test

Species: Mouse

Cell type: Bone marrow

Application Route: Intraperitoneal injection

Method: OECD Test Guideline 474

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**

May cause respiratory irritation.

**Specific target organ toxicity - repeated exposure**

No data available

**Aspiration hazard**

No data available

**11.2 Additional Information**

Repeated dose toxicity - Rat - male and female - Oral - 24 h - NOAEL (No observed adverse effect level) - 60 mg/kg - LOAEL (Lowest observed adverse effect level) - 125 mg/kg  
Remarks: (ECHA)

RTECS: CZ4500000

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                                                      | flow-through test LC50 - Oncorhynchus mykiss (rainbow trout) - 1.58 mg/l - 96 h<br>Remarks: (ECHA) |
| Toxicity to daphnia and other aquatic invertebrates                   | static test EC50 - Ceriodaphnia dubia (water flea) - 0.66 mg/l - 48 h (US-EPA)                     |
| Toxicity to algae                                                     | Growth rate EC50 - Pseudokirchneriella subcapitata (green algae) - 2.2 mg/l - 96 h (US-EPA)        |
| Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity) | semi-static test NOEC - Daphnia magna (Water flea) - 0.55 mg/l - 14 d<br>Remarks: (ECHA)           |

**12.2 Persistence and degradability**

|                  |                                                                                                        |
|------------------|--------------------------------------------------------------------------------------------------------|
| Biodegradability | aerobic - Exposure time 28 d<br>Result: 0 % - Not readily biodegradable.<br>(OECD Test Guideline 301C) |
|------------------|--------------------------------------------------------------------------------------------------------|

### 12.3 Bioaccumulative potential

Bioaccumulation      Cyprinus carpio (Carp) - 56 d  
- 0.01 mg/l(1,2-Dichlorobenzene)

Bioconcentration factor (BCF): 90 - 260  
(OECD Test Guideline 305C)

### 12.4 Mobility in soil

No data available

### 12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

### 12.6 Endocrine disrupting properties

No data available

### 12.7 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: 1591    Class: 6.1    Packing group: III  
Proper shipping name: o-Dichlorobenzene  
Reportable Quantity (RQ): 100 lbs  
Reportable Quantity (RQ): 10 lbs  
Poison Inhalation Hazard: No

#### IMDG

UN number: 1591    Class: 6.1    Packing group: III    EMS-  
No: F-A, S-A  
Proper shipping name: o-DICHLOROBENZENE  
Marine pollutant : yes

#### IATA

UN number: 1591    Class: 6.1    Packing group: III  
Proper shipping name: o-Dichlorobenzene

---

## SECTION 15: Regulatory information

### SARA 302 Components

Sigma-Aldrich - 240664

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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 |
|---------------------|---------|---------------|
| 1,2-Dichlorobenzene | 95-50-1 | 2007-03-01    |

### **SARA 311/312 Hazards**

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

:  
**Reportable Quantity** F002 lbs

### **Massachusetts Right To Know Components**

|                     | CAS-No. | Revision Date |
|---------------------|---------|---------------|
| 1,2-Dichlorobenzene | 95-50-1 | 2007-03-01    |

### **Pennsylvania Right To Know Components**

|                     | CAS-No. | Revision Date |
|---------------------|---------|---------------|
| 1,2-Dichlorobenzene | 95-50-1 | 2007-03-01    |

---

## **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: 6.7

Revision Date: 03/18/2023

Print Date: 10/07/2023

## SAFETY DATA SHEET

Version 6.4  
Revision Date 11/15/2022  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : 1,3-Dichlorobenzene

Product Number : 113808

Brand : Aldrich

Index-No. : 602-067-00-7

CAS-No. : 541-73-1

**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)**

Flammable liquids (Category 4), H227

Acute toxicity, Oral (Category 4), H302

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

Warning

|                            |                                                                                      |
|----------------------------|--------------------------------------------------------------------------------------|
| Hazard statement(s)        |                                                                                      |
| H227                       | Combustible liquid.                                                                  |
| H302                       | Harmful if swallowed.                                                                |
| H411                       | Toxic 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/ eye protection/ face protection.                             |
| P301 + P312 + P330         | IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth.          |
| P370 + P378                | In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish. |
| P391                       | Collect spillage.                                                                    |
| P403 + P235                | Store in a well-ventilated place. Keep cool.                                         |
| P501                       | Dispose of contents/ container to an approved waste disposal plant.                  |

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

|                  |                                                 |
|------------------|-------------------------------------------------|
| Formula          | : C <sub>6</sub> H <sub>4</sub> Cl <sub>2</sub> |
| Molecular weight | : 147.00 g/mol                                  |
| CAS-No.          | : 541-73-1                                      |
| EC-No.           | : 208-792-1                                     |
| Index-No.        | : 602-067-00-7                                  |

| Component                 | Classification                                                                         | Concentration |
|---------------------------|----------------------------------------------------------------------------------------|---------------|
| <b>1,3-dichlorbenzene</b> |                                                                                        |               |
|                           | Flam. Liq. 4; Acute Tox. 4; Aquatic Acute 2; Aquatic Chronic 2; H227, H302, 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**

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.

**Unsuitable extinguishing media**

Do NOT use water jet.

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

Carbon oxides

Hydrogen chloride gas

**5.3 Advice for firefighters**

Wear self-contained breathing apparatus for firefighting if necessary.

**5.4 Further information**

Use water spray to cool unopened containers.

---

**SECTION 6: Accidental release measures****6.1 Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Beware of vapors accumulating to form explosive concentrations. Vapors can accumulate in low areas. For personal protection see section 8.

**6.2 Environmental precautions**

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

**6.3 Methods and materials for containment and cleaning up**

Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13). Keep in suitable, closed containers for disposal.

**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 inhalation of vapor or mist.

#### **Advice on protection against fire and explosion**

Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

#### **Hygiene measures**

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

For precautions see section 2.2.

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

#### **Storage conditions**

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

#### **Storage class**

Storage class (TRGS 510): 10: Combustible liquids

### **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**

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

##### **Skin protection**

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact  
Material: Nitrile rubber  
Minimum layer thickness: 0.4 mm  
Break through time: 37 min  
Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the 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 respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

### **Control of environmental exposure**

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

---

## **SECTION 9: Physical and chemical properties**

### **9.1 Information on basic physical and chemical properties**

- |                                            |                                                        |
|--------------------------------------------|--------------------------------------------------------|
| a) Appearance                              | Form: liquid, clear<br>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: -25 - -22 °C (-13 - -8 °F) - lit. |
| f) Initial boiling point and boiling range | 172 - 173 °C 342 - 343 °F - lit.                       |
| g) Flash point                             | 67.0 °C (152.6 °F) - closed cup                        |
| h) Evaporation rate                        | No data available                                      |
| i) Flammability (solid, gas)               | No data available                                      |
| j) Upper/lower flammability or             | No data available                                      |

explosive limits

- |                                              |                                                 |
|----------------------------------------------|-------------------------------------------------|
| k) Vapor pressure                            | No data available                               |
| l) Vapor density                             | No data available                               |
| m) Density                                   | 1.288 g/cm <sup>3</sup> at 25 °C (77 °F) - lit. |
| Relative density                             | No data available                               |
| n) Water solubility                          | No data available                               |
| o) Partition coefficient:<br>n-octanol/water | log Pow: 5                                      |
| 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

Heat, flames and sparks.

### 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 - 500.01 mg/kg

Oral: No data available

Inhalation: No data available

Dermal: No data available

LD50 Intraperitoneal - Mouse - 1,062 mg/kg

**Skin corrosion/irritation**

Remarks: No data available

**Serious eye damage/eye irritation**

Remarks: 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

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**

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) - 7.8 mg/l - 96.0 h

Toxicity to daphnia and other aquatic invertebrates LC50 - Daphnia magna (Water flea) - 1.7 mg/l - 48 h

Toxicity to fish(Chronic toxicity) LOEC - Pimephales promelas (fathead minnow) - 2.3 mg/l - 32 d

NOEC - Pimephales promelas (fathead minnow) - 1 mg/l - 32 d

**12.2 Persistence and degradability**

No data available

**12.3 Bioaccumulative potential**

Bioaccumulation Pimephales promelas (fathead minnow) - 32 d

Aldrich - 113808

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- 0.3 mg/l(1,3-dichlorbenzene)

Bioconcentration factor (BCF): 97

#### **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 Endocrine disrupting properties**

No data available

#### **12.7 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.

---

### **SECTION 13: Disposal considerations**

#### **13.1 Waste treatment methods**

##### **Product**

Offer surplus and non-recyclable solutions to a licensed disposal company. This combustible material may be burned 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: 3082 Class: 9

Packing group: III

Proper shipping name: Environmentally hazardous substance, liquid, n.o.s. (1,3-dichlorbenzene)

Reportable Quantity (RQ): 100 lbs

Marine pollutant: yes

Poison Inhalation Hazard: No

#### **IMDG**

UN number: 3082 Class: 9

Packing group: III

EMS-No: F-A, S-F

Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (1,3-dichlorbenzene)

Marine pollutant : yes

Marine pollutant : no

#### **IATA**

UN number: 3082 Class: 9

Packing group: III

Proper shipping name: Environmentally hazardous substance, liquid, n.o.s. (1,3-dichlorbenzene)

#### **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

The following components are subject to reporting levels established by SARA Title III, Section 313:

|                    | CAS-No.  | Revision Date |
|--------------------|----------|---------------|
| 1,3-dichlorbenzene | 541-73-1 | 2020-07-14    |

### SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard

### Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

### Pennsylvania Right To Know Components

|                    | CAS-No.  | Revision Date |
|--------------------|----------|---------------|
| 1,3-dichlorbenzene | 541-73-1 | 2020-07-14    |

---

## 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: 6.4

Revision Date: 11/15/2022

Print Date: 10/07/2023

## SAFETY DATA SHEET

Version 6.8  
Revision Date 08/27/2023  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : 1,4-Dichlorobenzene

Product Number : D56829

Brand : Aldrich

Index-No. : 602-035-00-2

CAS-No. : 106-46-7

**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)**

Eye irritation (Category 2A), H319

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                | Warning                                                                                                                          |
| Hazard statement(s)        |                                                                                                                                  |
| H319                       | Causes serious eye irritation.                                                                                                   |
| H351                       | Suspected of causing cancer.                                                                                                     |
| H410                       | Very toxic to aquatic life with long lasting effects.                                                                            |
| Precautionary statement(s) |                                                                                                                                  |
| P201                       | Obtain special instructions before use.                                                                                          |
| P202                       | Do not handle until all safety precautions have been read and understood.                                                        |
| P264                       | Wash skin thoroughly after handling.                                                                                             |
| P273                       | Avoid release to the environment.                                                                                                |
| P280                       | Wear protective gloves/ protective clothing/ eye protection/ face protection.                                                    |
| P305 + P351 + P338         | IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. |
| P308 + P313                | IF exposed or concerned: Get medical advice/ attention.                                                                          |
| P337 + P313                | If eye irritation persists: 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

|                  |                                                 |
|------------------|-------------------------------------------------|
| Formula          | : C <sub>6</sub> H <sub>4</sub> Cl <sub>2</sub> |
| Molecular weight | : 147.00 g/mol                                  |
| CAS-No.          | : 106-46-7                                      |
| EC-No.           | : 203-400-5                                     |
| Index-No.        | : 602-035-00-2                                  |

| Component                  | Classification                                                                                                                | Concentration |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>1,4-dichlorobenzene</b> |                                                                                                                               |               |
|                            | Eye Irrit. 2A; Carc. 2;<br>Aquatic Acute 1; Aquatic<br>Chronic 1; H319, H351,<br>H400, H410<br>M-Factor - Aquatic Acute:<br>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

After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

#### Suitable extinguishing media

Water Foam Carbon dioxide (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

Nature of decomposition products not known.

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 dry. 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.

#### Storage class

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

| Component           | CAS-No.  | Value                                                        | Control parameters | Basis                                   |
|---------------------|----------|--------------------------------------------------------------|--------------------|-----------------------------------------|
| 1,4-dichlorobenzene | 106-46-7 | TWA                                                          | 10 ppm             | USA. ACGIH Threshold Limit Values (TLV) |
|                     | Remarks  | Confirmed animal carcinogen with unknown relevance to humans |                    |                                         |

| Potential Occupational Carcinogen |  |      |                                  |                                                                                         |
|-----------------------------------|--|------|----------------------------------|-----------------------------------------------------------------------------------------|
|                                   |  | TWA  | 75 ppm<br>450 mg/m <sup>3</sup>  | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|                                   |  | PEL  | 10 ppm<br>60 mg/m <sup>3</sup>   | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|                                   |  | C    | 200 ppm                          | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|                                   |  | STEL | 110 ppm<br>675 mg/m <sup>3</sup> | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |

## 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

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 EN 16523-1 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

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 EN 16523-1 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: 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

Recommended Filter type: Filter A-(P3)

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer.

These measures have to be properly documented.

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                 | Melting point/freezing point: 53.3 °C (127.9 °F)                              |
| f) Initial boiling point and boiling range      | 174.1 °C 345.4 °F at 1,013 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                               | 8.8 hPa at 50.0 °C (122.0 °F)                                                 |
| l) Vapor density                                | No data available                                                             |
| m) Density                                      | 1.46 g/cm <sup>3</sup> at 20 °C (68 °F)                                       |
|                                                 | Relative density 1.4620 °C                                                    |
| n) Water solubility                             | 82.9 mg/l at 25 °C (77 °F) - slightly soluble                                 |
| o) Partition coefficient: n-octanol/water       | log Pow: 3.37 at 25 °C (77 °F) - Bioaccumulation is not expected.             |
| p) Autoignition temperature                     | > 500 °C (> 932 °F)Information taken from reference works and the literature. |
| q) Decomposition temperature                    | No data available                                                             |
| r) Viscosity                                    | No data available                                                             |

s) Explosive properties No data available

t) Oxidizing properties none

## **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**

Exothermic reaction with:

Alkali metals

Alkaline earth metals

Oxidizing agents

Nitric acid

Risk of explosion with:

Nitric acid

with

sulfuric acid

### **10.4 Conditions to avoid**

no information available

### **10.5 Incompatible materials**

Aluminum

### **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 and female - > 2,000 mg/kg

(OECD Test Guideline 401)

LC50 Inhalation - Rat - male and female - 4 h - > 5.07 mg/l - vapor

(OECD Test Guideline 403)

LD50 Dermal - Rat - male and female - > 2,000 mg/kg

(OECD Test Guideline 402)

No data available

**Skin corrosion/irritation**

Skin - Rabbit

Result: No skin irritation

(OECD Test Guideline 404)

**Serious eye damage/eye irritation**

Remarks: Causes serious eye irritation.

Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

**Respiratory or skin sensitization**

Maximization Test - Guinea pig

Result: negative

(OECD Test Guideline 406)

**Germ cell mutagenicity**

Test Type: Ames test

Test system: Salmonella typhimurium

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 471

Result: negative

Test Type: Micronucleus test

Species: Mouse

Cell type: Bone marrow

Application Route: Oral

Result: negative

Remarks: (ECHA)

**Carcinogenicity**

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

Limited evidence of carcinogenicity in animal studies

IARC: 2B - Group 2B: Possibly carcinogenic to humans (1,4-dichlorobenzene)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (1,4-dichlorobenzene)

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: CZ4550000

Produces:, methemoglobin, Nausea, Vomiting, Increased pulse rate, Headache, Impairment of vision

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                                                      | flow-through test LC50 - <i>Salmo gairdneri</i> - 1.12 mg/l - 96 h<br>Remarks: (ECHA)                     |
| Toxicity to daphnia and other aquatic invertebrates                   | static test EC50 - <i>Daphnia magna</i> (Water flea) - 0.7 mg/l - 48 h<br>Remarks: (ECHA)                 |
| Toxicity to algae                                                     | static test ErC50 - <i>Pseudokirchneriella subcapitata</i> (green algae) - 1.6 mg/l - 96 h<br>(US-EPA)    |
| Toxicity to fish(Chronic toxicity)                                    | flow-through test NOEC - <i>Jordanella floridae</i> - 0.2 - 0.23 mg/l - 14 d<br>(OECD Test Guideline 210) |
| Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity) | semi-static test NOEC - <i>Daphnia magna</i> (Water flea) - 0.22 mg/l - 28 d<br>Remarks: (ECHA)           |

### 12.2 Persistence and degradability

|                  |                                                                                                      |
|------------------|------------------------------------------------------------------------------------------------------|
| Biodegradability | aerobic - Exposure time 28 d<br>Result: 100 % - Readily biodegradable.<br>(OECD Test Guideline 301C) |
|------------------|------------------------------------------------------------------------------------------------------|

### 12.3 Bioaccumulative potential

|                 |                                                                                                                         |
|-----------------|-------------------------------------------------------------------------------------------------------------------------|
| Bioaccumulation | <i>Jordanella floridae</i> - 5 d<br>at 25 °C - 2.68 µg/l(1,4-dichlorobenzene)<br><br>Bioconcentration factor (BCF): 296 |
|-----------------|-------------------------------------------------------------------------------------------------------------------------|

### 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 Endocrine disrupting properties

No data available

### 12.7 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.

---

## SECTION 14: Transport information

#### DOT (US)

UN number: 3077    Class: 9    Packing group: III  
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (1,4-dichlorobenzene)  
Reportable Quantity (RQ): 100 lbs  
Reportable Quantity (RQ): 100 lbs  
Marine pollutant: yes    Poison Inhalation Hazard: No

#### IMDG

UN number: 3077    Class: 9    Packing group: III    EMS-No: F-A, S-F  
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (1,4-dichlorobenzene)  
Marine pollutant : yes  
Marine pollutant : no

#### IATA

UN number: 3077    Class: 9    Packing group: III  
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (1,4-dichlorobenzene)

---

## 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 |
|---------------------|----------|---------------|
| 1,4-dichlorobenzene | 106-46-7 | 2020-07-14    |

#### SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

:  
**Reportable Quantity**    D027 lbs

#### Massachusetts Right To Know Components

|                     | CAS-No.  | Revision Date |
|---------------------|----------|---------------|
| 1,4-dichlorobenzene | 106-46-7 | 2020-07-14    |



**Pennsylvania Right To Know Components**

1,4-dichlorobenzene

CAS-No.  
106-46-7Revision Date  
2020-07-14**California Prop. 65 Components**

, which is/are known to the State of California to  
cause cancer. For more information go to  
[www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov). 1,4-dichlorobenzene

CAS-No.  
106-46-7Revision Date  
2007-09-28

---

**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: 6.8

Revision Date: 08/27/2023

Print Date: 10/07/2023

## SAFETY DATA SHEET

Version 6.5  
Revision Date 05/24/2023  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : 1,2,4-Trimethylbenzene

Product Number : T73601

Brand : Aldrich

Index-No. : 601-043-00-3

CAS-No. : 95-63-6

**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)**

Flammable liquids (Category 3), H226

Acute toxicity, Inhalation (Category 4), H332

Skin irritation (Category 2), H315

Eye irritation (Category 2A), H319

Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

Aspiration hazard (Category 1), H304

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)

|      |                                                  |
|------|--------------------------------------------------|
| H226 | Flammable liquid and vapor.                      |
| 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 statement(s)

|                    |                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------|
| P210               | Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.                                                              |
| P233               | Keep container tightly closed.                                                                                                   |
| P240               | Ground/bond container and receiving equipment.                                                                                   |
| P241               | Use explosion-proof electrical/ ventilating/ lighting/ equipment.                                                                |
| P242               | Use only non-sparking tools.                                                                                                     |
| P243               | Take precautionary measures against static discharge.                                                                            |
| P261               | Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray.                                                                            |
| P264               | Wash skin thoroughly after handling.                                                                                             |
| P271               | Use only outdoors or in a well-ventilated area.                                                                                  |
| P273               | Avoid release to the environment.                                                                                                |
| P280               | Wear protective gloves/ eye protection/ face protection.                                                                         |
| P301 + P310        | IF SWALLOWED: Immediately call a POISON CENTER/ doctor.                                                                          |
| P303 + P361 + P353 | IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.                             |
| P304 + P340 + P312 | IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.      |
| P305 + P351 + P338 | IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. |
| P331               | Do NOT induce vomiting.                                                                                                          |
| P332 + P313        | If skin irritation occurs: Get medical advice/ attention.                                                                        |
| P337 + P313        | If eye irritation persists: Get medical advice/ attention.                                                                       |
| P362               | Take off contaminated clothing and wash before reuse.                                                                            |
| P370 + P378        | In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.                                             |
| P391               | Collect spillage.                                                                                                                |
| P403 + P233        | Store in a well-ventilated place. Keep container tightly closed.                                                                 |
| P403 + P235        | Store in a well-ventilated place. Keep cool.                                                                                     |
| P405               | Store locked up.                                                                                                                 |
| P501               | Dispose of contents/ container to an approved waste disposal plant.                                                              |

## 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Formula : C<sub>9</sub>H<sub>12</sub>  
Molecular weight : 120.19 g/mol  
CAS-No. : 95-63-6  
EC-No. : 202-436-9  
Index-No. : 601-043-00-3

| Component                     | Classification                                                                                                                                                                         | Concentration |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>1,2,4-Trimethylbenzene</b> |                                                                                                                                                                                        |               |
|                               | Flam. Liq. 3; Acute Tox. 4;<br>Skin Irrit. 2; Eye Irrit. 2A;<br>STOT SE 3; Asp. Tox. 1;<br>Aquatic Acute 2; Aquatic<br>Chronic 2; H226, H332,<br>H315, H319, H335, H304,<br>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

Wash off with soap and plenty of water. Consult a physician.

#### In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

#### If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

## **SECTION 5: Firefighting measures**

### **5.1 Extinguishing media**

#### **Suitable extinguishing media**

Dry powder Dry sand

#### **Unsuitable extinguishing media**

Do NOT use water jet.

### **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**

Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapors accumulating to form explosive concentrations. Vapors can accumulate in low areas.

For personal protection see section 8.

### **6.2 Environmental precautions**

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

### **6.3 Methods and materials for containment and cleaning up**

Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13).

### **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 inhalation of vapor or mist.

#### **Advice on protection against fire and explosion**

Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

#### **Hygiene measures**

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

For precautions see section 2.2.

## 7.2 Conditions for safe storage, including any incompatibilities

### Storage conditions

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

### Storage class

Storage class (TRGS 510): 3: Flammable liquids

## 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                                                                                   |
|------------------------|---------|----------------------------------------|---------------------------------|-----------------------------------------------------------------------------------------|
| 1,2,4-Trimethylbenzene | 95-63-6 | TWA                                    | 10 ppm                          | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|                        | Remarks | Not classifiable as a human carcinogen |                                 |                                                                                         |
|                        |         | TWA                                    | 25 ppm<br>125 mg/m <sup>3</sup> | USA. NIOSH Recommended Exposure Limits                                                  |
|                        |         | PEL                                    | 25 ppm<br>125 mg/m <sup>3</sup> | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |

### 8.2 Exposure controls

#### Appropriate engineering controls

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

#### Personal protective equipment

##### Eye/face protection

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

##### Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact

Material: Nitrile rubber  
Minimum layer thickness: 0.4 mm  
Break through time: 30 min  
Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the 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, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

### **Respiratory protection**

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

### **Control of environmental exposure**

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

---

## **SECTION 9: Physical and chemical properties**

### **9.1 Information on basic physical and chemical properties**

- |                                            |                                                                    |
|--------------------------------------------|--------------------------------------------------------------------|
| a) Appearance                              | Form: liquid, clear<br>Color: colorless                            |
| b) Odor                                    | No data available                                                  |
| c) Odor Threshold                          | No data available                                                  |
| d) pH                                      | No data available                                                  |
| e) Melting point/freezing point            | -43.7 °C (-46.7 °F)                                                |
| f) Initial boiling point and boiling range | 168.0 - 169.0 °C 334.4 - 336.2 °F                                  |
| g) Flash point                             | 48.0 °C (118.4 °F) - closed cup                                    |
| h) Evaporation rate                        | No data available                                                  |
| i) Flammability (solid, gas)               | No data available                                                  |
| j) Upper/lower flammability or             | Upper explosion limit: 6.4 %(V)<br>Lower explosion limit: 0.9 %(V) |

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explosive limits

- |                                              |                                               |
|----------------------------------------------|-----------------------------------------------|
| k) Vapor pressure                            | 2.3 hPa at 20.0 °C (68.0 °F)                  |
| l) Vapor density                             | No data available                             |
| m) Density                                   | 0.88 g/cm <sup>3</sup>                        |
| Relative density                             | No data available                             |
| n) Water solubility                          | 0.057 g/l at 25 °C (77 °F) - slightly soluble |
| o) Partition coefficient:<br>n-octanol/water | No data available                             |
| p) Autoignition<br>temperature               | 515.0 °C (959.0 °F)                           |
| 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

Heat, flames and sparks.

### 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 - male - 6,000 mg/kg

Inhalation: No data available

Dermal: No data available

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No data available

**Skin corrosion/irritation**

Remarks: No data available

**Serious eye damage/eye irritation**

Remarks: No data available

**Respiratory or skin sensitization**

No data available

**Germ cell mutagenicity**

Test Type: in vitro test

Test system: *S. typhimurium*

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 471

Result: negative

Test Type: In vivo micronucleus test

Species: Rat

Cell type: Bone marrow

Application Route: Intraperitoneal

Method: Mutagenicity (micronucleus test)

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

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: DC3325000

prolonged or repeated exposure can cause:, narcosis, Bronchitis., Symptoms and signs include headache, dizziness, fatigue, muscular weakness, drowsiness and in extreme cases, loss of consciousness., 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                                    | flow-through test LC50 - Pimephales promelas (fathead minnow) - 7.72 mg/l - 96.0 h        |
| Toxicity to daphnia and other aquatic invertebrates | static test EC50 - Daphnia magna (Water flea) - 3.6 mg/l - 48 h (OECD Test Guideline 202) |

### 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 Endocrine disrupting properties

No data available

### 12.7 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.

---

## SECTION 13: Disposal considerations

### 13.1 Waste treatment methods

#### Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Contact a licensed professional waste disposal service to dispose of this material.

#### Contaminated packaging

Dispose of as unused product.

---

## SECTION 14: Transport information

### DOT (US)

UN number: 3295    Class: 3    Packing group: III  
Proper shipping name: Hydrocarbons, liquid, n.o.s.  
Reportable Quantity (RQ):  
Poison Inhalation Hazard: No

**IMDG**

UN number: 3295 Class: 3 Packing group: III  
Proper shipping name: HYDROCARBONS, LIQUID, N.O.S.

EMS-No: F-E, S-D

**IATA**

UN number: 3295 Class: 3 Packing group: III  
Proper shipping name: Hydrocarbons, liquid, n.o.s.

---

**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 |
|------------------------|---------|---------------|
| 1,2,4-Trimethylbenzene | 95-63-6 | 2007-07-01    |

**SARA 311/312 Hazards**

Fire Hazard, Acute Health Hazard

**Massachusetts Right To Know Components**

|                        | CAS-No. | Revision Date |
|------------------------|---------|---------------|
| 1,2,4-Trimethylbenzene | 95-63-6 | 2007-07-01    |

|                        | CAS-No. | Revision Date |
|------------------------|---------|---------------|
| 1,2,4-Trimethylbenzene | 95-63-6 | 2007-07-01    |

**Pennsylvania Right To Know Components**

|                        | CAS-No. | Revision Date |
|------------------------|---------|---------------|
| 1,2,4-Trimethylbenzene | 95-63-6 | 2007-07-01    |

|                        | CAS-No. | Revision Date |
|------------------------|---------|---------------|
| 1,2,4-Trimethylbenzene | 95-63-6 | 2007-07-01    |

**New Jersey Right To Know Components**

|                        | CAS-No. | Revision Date |
|------------------------|---------|---------------|
| 1,2,4-Trimethylbenzene | 95-63-6 | 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 [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: 05/24/2023

Print Date: 10/07/2023

## SAFETY DATA SHEET

Version 6.9  
Revision Date 07/25/2023  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Acetone

Product Number : 179124  
Brand : SIGALD  
Index-No. : 606-001-00-8  
CAS-No. : 67-64-1

**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)**

Flammable liquids (Category 2), H225

Eye irritation (Category 2A), H319

Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336

For the full text of the H-Statements mentioned in this Section, see Section 16.

**2.2 GHS Label elements, including precautionary statements**

Pictogram



Signal Word

Danger

SIGALD - 179124

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|                            |                                                                                                                                  |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Hazard statement(s)        |                                                                                                                                  |
| H225                       | Highly flammable liquid and vapor.                                                                                               |
| H319                       | Causes serious eye irritation.                                                                                                   |
| H336                       | May cause drowsiness or dizziness.                                                                                               |
| Precautionary statement(s) |                                                                                                                                  |
| P210                       | Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.                                                              |
| P233                       | Keep container tightly closed.                                                                                                   |
| P240                       | Ground/bond container and receiving equipment.                                                                                   |
| P241                       | Use explosion-proof electrical/ ventilating/ lighting/ equipment.                                                                |
| P242                       | Use only non-sparking tools.                                                                                                     |
| P243                       | Take precautionary measures against static discharge.                                                                            |
| P261                       | Avoid breathing mist or vapors.                                                                                                  |
| P264                       | Wash skin thoroughly after handling.                                                                                             |
| P271                       | Use only outdoors or in a well-ventilated area.                                                                                  |
| P280                       | Wear protective gloves/ eye protection/ face protection.                                                                         |
| P303 + P361 + P353         | IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.                             |
| P304 + P340 + P312         | IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.      |
| P305 + P351 + P338         | IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. |
| P337 + P313                | If eye irritation persists: Get medical advice/ attention.                                                                       |
| P370 + P378                | In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.                                             |
| P403 + P233                | Store in a well-ventilated place. Keep container tightly closed.                                                                 |
| P403 + P235                | Store in a well-ventilated place. Keep cool.                                                                                     |
| P405                       | Store locked up.                                                                                                                 |
| P501                       | Dispose of contents/ container to an approved waste disposal plant.                                                              |

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Repeated exposure may cause skin dryness or cracking.

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

|                  |                                   |
|------------------|-----------------------------------|
| Formula          | : C <sub>3</sub> H <sub>6</sub> O |
| Molecular weight | : 58.08 g/mol                     |
| CAS-No.          | : 67-64-1                         |
| EC-No.           | : 200-662-2                       |
| Index-No.        | : 606-001-00-8                    |

| Component      | Classification                                                                    | Concentration |
|----------------|-----------------------------------------------------------------------------------|---------------|
| <b>acetone</b> |                                                                                   |               |
|                | Flam. Liq. 2; Eye Irrit. 2A; STOT SE 3; H225, H319, H336<br>Concentration limits: | <= 100 %      |

|  |                              |  |
|--|------------------------------|--|
|  | >= 20 %: STOT SE 3,<br>H336; |  |
|--|------------------------------|--|

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.

#### **In case of eye contact**

After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

#### **If swallowed**

After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

#### **Suitable extinguishing media**

Carbon dioxide (CO<sub>2</sub>) Foam 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.

Pay attention to flashback.

Vapors are heavier than air and may spread along floors.

Development of hazardous combustion gases or vapours possible in the event of fire.

Forms explosive mixtures with air at ambient temperatures.

### 5.3 Advice for firefighters

In the event of fire, wear self-contained breathing apparatus.

## 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. Risk of explosion.

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

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent material (e.g. Chemizorb® ). Dispose of properly. Clean up affected area.

### 6.4 Reference to other sections

For disposal see section 13.

---

## SECTION 7: Handling and storage

### 7.1 Precautions for safe handling

#### Advice on safe handling

Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

#### 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

Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.

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. Keep away from heat and sources of ignition.

#### Storage class

Storage class (TRGS 510): 3: Flammable liquids

### 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                                                                                   |
|-----------|---------|----------------------------------------|--------------------------------------|-----------------------------------------------------------------------------------------|
| acetone   | 67-64-1 | TWA                                    | 250 ppm                              | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|           | Remarks | Not classifiable as a human carcinogen |                                      |                                                                                         |
|           |         | STEL                                   | 500 ppm                              | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|           |         | Not classifiable as a human carcinogen |                                      |                                                                                         |
|           |         | TWA                                    | 250 ppm<br>590 mg/m <sup>3</sup>     | USA. NIOSH Recommended Exposure Limits                                                  |
|           |         | TWA                                    | 1,000 ppm<br>2,400 mg/m <sup>3</sup> | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|           |         | C                                      | 3,000 ppm                            | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|           |         | PEL                                    | 500 ppm<br>1,200 mg/m <sup>3</sup>   | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|           |         | STEL                                   | 750 ppm<br>1,780 mg/m <sup>3</sup>   | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |

#### Biological occupational exposure limits

| Component | CAS-No. | Parameters                                               | Value   | Biological specimen | Basis                                     |
|-----------|---------|----------------------------------------------------------|---------|---------------------|-------------------------------------------|
| acetone   | 67-64-1 | Acetone                                                  | 25 mg/l | Urine               | ACGIH - Biological Exposure Indices (BEI) |
|           | Remarks | End of shift (As soon as possible after exposure ceases) |         |                     |                                           |

#### Derived No Effect Level (DNEL)

| Application Area | Routes of exposure | Health effect              | Value                  |
|------------------|--------------------|----------------------------|------------------------|
| Workers          | Skin contact       | Long-term systemic effects | 186mg/kg BW/d          |
| Consumers        | Ingestion          | Long-term systemic effects | 62mg/kg BW/d           |
| Consumers        | Skin contact       | Long-term systemic effects | 62mg/kg BW/d           |
| Workers          | Inhalation         | Acute systemic effects     | 2420 mg/m <sup>3</sup> |
| Workers          | Inhalation         | Long-term systemic effects | 1210 mg/m <sup>3</sup> |
| Consumers        | Inhalation         | Long-term systemic effects | 200 mg/m <sup>3</sup>  |

**Predicted No Effect Concentration (PNEC)**

| Compartment                   | Value      |
|-------------------------------|------------|
| Soil                          | 33.3 mg/kg |
| Sea water                     | 1.06 mg/l  |
| Fresh water                   | 10.6 mg/l  |
| Sea sediment                  | 3.04 mg/kg |
| Fresh water sediment          | 30.4 mg/kg |
| Onsite sewage treatment plant | 100 mg/l   |

**8.2 Exposure controls****Appropriate engineering controls**

Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.

**Personal protective equipment****Eye/face protection**

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

**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: butyl-rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Butoject® (KCL 898)

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: 10 min

Material tested: Lapren® (KCL 706 / Aldrich Z677558, Size M)

**Body Protection**

Flame retardant antistatic protective clothing.

**Respiratory protection**

Recommended Filter type: Filter type AX

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer.

These measures have to be properly documented.

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. Risk of explosion.

---

## SECTION 9: Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

|                                                 |                                                                 |
|-------------------------------------------------|-----------------------------------------------------------------|
| a) Appearance                                   | Form: clear, liquid<br>Color: colorless                         |
| b) Odor                                         | pungent, weakly aromatic                                        |
| c) Odor Threshold                               | 0.1 ppm                                                         |
| d) pH                                           | 5 - 6 at 395 g/l at 20 °C (68 °F)                               |
| e) Melting point/freezing point                 | Melting point/range: -94 °C (-137 °F) - lit.                    |
| f) Initial boiling point and boiling range      | 56 °C 133 °F at 1,013 hPa - lit.                                |
| g) Flash point                                  | -17.0 °C (1.4 °F) - closed cup                                  |
| h) Evaporation rate                             | No data available                                               |
| i) Flammability (solid, gas)                    | No data available                                               |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 13 %(V)<br>Lower explosion limit: 2 %(V) |
| k) Vapor pressure                               | 245.3 hPa at 20.0 °C (68.0 °F)                                  |
| l) Vapor density                                | No data available                                               |
| m) Density                                      | 0.791 g/cm <sup>3</sup> at 25 °C (77 °F) - lit.                 |
| Relative density                                | No data available                                               |
| n) Water solubility                             | soluble, in all proportions                                     |
| o) Partition coefficient: n-octanol/water       | No data available                                               |
| p) Autoignition temperature                     | 465.0 °C (869.0 °F)                                             |
| q) Decomposition temperature                    | Distillable in an undecomposed state at normal pressure.        |
| r) Viscosity                                    | No data available                                               |
| s) Explosive properties                         | No data available                                               |
| t) Oxidizing properties                         | none                                                            |

### 9.2 Other safety information

|                 |                                |
|-----------------|--------------------------------|
| Conductivity    | 0.01 µS/cm at 20 °C (68 °F)    |
| Surface tension | 23.2 mN/m at 20.0 °C (68.0 °F) |

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## **SECTION 10: Stability and reactivity**

### **10.1 Reactivity**

Vapors may form explosive mixture with air.

### **10.2 Chemical stability**

The product is chemically stable under standard ambient conditions (room temperature) .

### **10.3 Possibility of hazardous reactions**

Risk of ignition or formation of inflammable gases or vapours with:

chromosulfuric acid

chromyl chloride

ethanolamine

Fluorine

Strong oxidizing agents

strong reducing agents

Nitric acid

chromium(VI) oxide

Risk of explosion with:

nonmetallic oxyhalides

halogen-halogen compounds

Chloroform

nitrating acid

nitrosyl compounds

hydrogen peroxide

halogen oxides

organic nitro compounds

peroxi compounds

Exothermic reaction with:

Bromine

Alkali metals

alkali hydroxides

Halogenated hydrocarbon

Sulfur dichloride

phosphorous oxichloride

### **10.4 Conditions to avoid**

Warming.

### **10.5 Incompatible materials**

rubber, various plastics

### **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 - female - 5,800 mg/kg

Remarks: (ECHA)

LC50 Inhalation - Rat - 4 h - 76 mg/l - vapor

Remarks: Unconsciousness

Drowsiness

Dizziness

(External MSDS)

LD50 Dermal - Rabbit - 20,000 mg/kg

Remarks: (IUCLID)

#### Skin corrosion/irritation

Skin - Rabbit

Result: Mild skin irritation - 24 h

(Draize Test)

Remarks: (RTECS)

#### Serious eye damage/eye irritation

Eyes - Rabbit

Result: Eye irritation - 24 h

(Draize Test)

Remarks: (RTECS)

#### Respiratory or skin sensitization

Maximization Test - Guinea pig

Result: Not a skin sensitizer.

Remarks: (ECHA)

Chronic exposure may cause dermatitis.

#### Germ cell mutagenicity

Test Type: Mutagenicity (mammal cell test): chromosome aberration.

Test system: Chinese hamster ovary cells

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 473

Result: negative

Test Type: Ames test

Test system: Salmonella typhimurium

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 471

Result: negative

Test Type: In vitro mammalian cell gene mutation test

Test system: Mouse lymphoma test

Metabolic activation: without metabolic activation

Method: OECD Test Guideline 476

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**

Inhalation - May cause drowsiness or dizziness. - Narcotic effects

**Specific target organ toxicity - repeated exposure**

No data available

**Aspiration hazard**

No data available

**11.2 Additional Information**

RTECS: AL3150000

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

After absorption:

Headache  
Salivation  
Nausea  
Vomiting  
Dizziness  
narcosis  
Coma

Other dangerous properties can not be excluded.

Handle in accordance with good industrial hygiene and safety practice.

Kidney - Irregularities - Based on Human Evidence

Skin - Dermatitis - Based on Human Evidence

Kidney - Irregularities - Based on Human Evidence

Skin - Dermatitis - Based on Human Evidence

---

**SECTION 12: Ecological information**

**12.1 Toxicity**

|                  |                                                                                                                   |
|------------------|-------------------------------------------------------------------------------------------------------------------|
| Toxicity to fish | flow-through test LC50 - Pimephales promelas (fathead minnow) -<br>6,210 mg/l - 96 h<br>(OECD Test Guideline 203) |
|------------------|-------------------------------------------------------------------------------------------------------------------|

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|                                                                       |                                                                                                                                   |
|-----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Toxicity to daphnia and other aquatic invertebrates                   | static test LC50 - Daphnia pulex (Water flea) - 8,800 mg/l - 48 h<br>Remarks: (ECHA)                                              |
| Toxicity to algae                                                     | static test NOEC - M.aeruginosa - 530 mg/l - 8 d<br>(DIN 38412)<br>Remarks: (maximum permissible toxic concentration)<br>(IUCLID) |
| Toxicity to bacteria                                                  | static test EC50 - activated sludge - 61.15 mg/l - 30 min<br>(OECD Test Guideline 209)                                            |
| Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity) | flow-through test NOEC - Daphnia magna (Water flea) - 2,212 mg/l - 28 d<br>Remarks: (ECHA)                                        |

## 12.2 Persistence and degradability

|                                 |                                                                                                     |
|---------------------------------|-----------------------------------------------------------------------------------------------------|
| Biodegradability                | aerobic - Exposure time 28 d<br>Result: 91 % - Readily biodegradable.<br>(OECD Test Guideline 301B) |
| Biochemical Oxygen Demand (BOD) | 1,850 mg/g<br>Remarks: (IUCLID)                                                                     |
| Chemical Oxygen Demand (COD)    | 2,070 mg/g<br>Remarks: (IUCLID)                                                                     |
| Theoretical oxygen demand       | 2,200 mg/g<br>Remarks: (Lit.)                                                                       |

## 12.3 Bioaccumulative potential

Does not bioaccumulate.

## 12.4 Mobility in soil

No data available

## 12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

## 12.6 Endocrine disrupting properties

No data available

## 12.7 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.

---

**SECTION 14: Transport information****DOT (US)**

UN number: 1090    Class: 3    Packing group: II  
Proper shipping name: Acetone  
Reportable Quantity (RQ): 5000 lbs  
Poison Inhalation Hazard: No

**IMDG**

UN number: 1090    Class: 3    Packing group: II    EMS-No: F-E, S-D  
Proper shipping name: ACETONE

**IATA**

UN number: 1090    Class: 3    Packing group: II  
Proper shipping name: Acetone

---

**SECTION 15: Regulatory information****SARA 302 Components**

This material does not contain any components with a section 302 EHS TPQ.

**SARA 313 Components**

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

**SARA 311/312 Hazards**

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

**Massachusetts Right To Know Components**

|         |                    |                             |
|---------|--------------------|-----------------------------|
| acetone | CAS-No.<br>67-64-1 | Revision Date<br>1993-02-16 |
|---------|--------------------|-----------------------------|

**Pennsylvania Right To Know Components**

|         |                    |                             |
|---------|--------------------|-----------------------------|
| acetone | CAS-No.<br>67-64-1 | Revision Date<br>1993-02-16 |
|---------|--------------------|-----------------------------|



---

## 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: 6.9

Revision Date: 07/25/2023

Print Date: 10/07/2023

Effective date: 11 May 2023

Revision: 11 May 2023

Trade Name: Alconox® Powdered Precision Cleaner

**I Identification of the substance/mixture and of the supplier****I.1 GHS Product identifier**

Trade Name: Alconox® Powdered Precision Cleaner

Product number: 1101, 1103, 1104, 1104-1, 1112, 1112-1, 1125, 1150

**I.2 Application of the substance / the mixture: Cleaning material/Detergent****I.2.1 Recommended dilution ratio: 1 – 2% in water****I.3 Details of the supplier of the Safety Data Sheet****Manufacturer:**

Alconox Inc.  
30 Glenn St  
White Plains, NY 10603  
(914) 948-4040

**Supplier:**

Not Applicable

**Emergency telephone number:**

ChemTel Inc

North America: 1-888-255-3924

International: +1 813-248-0573

**2 Hazards identification****2.1 Classification of the substance or mixture:**

In compliance with EC regulation No. 1272, 29CFR1910/1200 and GHS requirements.

**Hazard-determining components of labeling:**

Tetrasodium Pyrophosphate

Sodium tripolyphosphate

Sodium Alkylbenzene Sulfonate

**2.2 Label elements:**

Eye damage, category 1.

Skin irritation, category 2.

**Product at recommended dilution:**

Eye irritation, category 2B

**Hazard pictograms:****Signal word:** Danger**Hazard statements:**

H315 Causes skin irritation.

H318 Causes serious eye damage.

**Precautionary statements:**

P264 Wash skin thoroughly after handling.

F7303-1.0-20200511 | SDS11E.1 | Created by Alconox Inc. | (914) 948-4040 | [www.alconox.com](http://www.alconox.com)

Effective date: 11 May 2023

Revision: 11 May 2023

Trade Name: Alconox® Powdered Precision Cleaner

P280 Wear protective gloves/protective clothing/eye protection/face protection.

P302+P352 If on skin: Wash with soap and water.

P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.

P321 Specific treatment (see supplemental first aid instructions on this label).

P332+P313 If skin irritation occurs: Get medical advice/attention.

P362 Take off contaminated clothing and wash before reuse.

P501 Dispose of contents and container as instructed in Section 13.

**Hazardous Elements at Use Dilution:**

Hazard Pictograms:

**Signal Word:** Warning**Hazard Statements:**

H320 Causes eye irritation

**Precautionary statements:**

P302+P352 If on skin: Wash with soap and water.

P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.

P501 Dispose of contents and container as instructed in Section 13

**Additional information:** None.**Hazard description****Hazards Not Otherwise Classified (HNOC):** May cause surfaces to become slippery if wet. Use caution in areas of foot traffic if on floors.**Information concerning particular hazards for humans and environment:**

The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

**Classification system:**

The classification is according to EC regulation No. 1272, 29CFR1910/1200 and GHS Requirements, and extended by company and literature data. The classification is in accordance with the latest editions of international substances lists and is supplemented by information from technical literature and by information provided by the company.

**3 Composition/information on ingredients****3.1 Chemical characterization:** Not determined or not available.**3.2 Description:** None**3.3 Hazardous components (percentages by weight)**

| Identification                                    | Chemical Name                 | Classification                                                | Wt. % |
|---------------------------------------------------|-------------------------------|---------------------------------------------------------------|-------|
| <b>CAS number:</b><br>7758-29-4                   | Sodium tripolyphosphate       | Skin Irrit. 2; H315<br>Eye Irrit. 2; H319                     | 12-28 |
| <b>CAS number:</b><br>68081-81-2 or<br>68411-30-3 | Sodium Alkylbenzene Sulfonate | Acute Tox. 4; H303<br>Skin Irrit. 2; H315<br>Eye Dam. 1; H318 | 8-22  |
| <b>CAS number:</b><br>7722-88-5                   | Tetrasodium Pyrophosphate     | Skin Irrit. 2; H315<br>Eye Irrit. 2; H319                     | 2-16  |

Effective date: 11 May 2023

Revision: 11 May 2023

Trade Name: Alconox® Powdered Precision Cleaner

Hazardous components at use dilution (percentages by weight):

| Identification                                    | Chemical Name                 | Classification     | Wt. %       |
|---------------------------------------------------|-------------------------------|--------------------|-------------|
| <b>CAS number:</b><br>7758-29-4                   | Sodium tripolyphosphate       | Eye Irrit. 2; H319 | 0.12 - 0.28 |
| <b>CAS number:</b><br>68081-81-2 or<br>68411-30-3 | Sodium Alkylbenzene Sulfonate | Eye Irrit. 2; H319 | 0.08 – 0.22 |
| <b>CAS number:</b><br>7722-88-5                   | Tetrasodium Pyrophosphate     | Eye Irrit. 2; H319 | 0.02 – 0.16 |

**3.4 Additional Information:** None.**4 First aid measures****4.1 Description of first aid measures****General information:** None.**After inhalation:**

Maintain an unobstructed airway.

Loosen clothing as necessary and position individual in a comfortable position.

**After skin contact:**

Wash affected area with soap and water.

Seek medical attention if symptoms develop or persist.

**After eye contact:**

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.

Seek medical attention if irritation, discomfort, or vomiting persists.

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

None

**4.3 Indication of any immediate medical attention and special treatment needed:**

No additional information.

**First aid measure at recommended dilution:****General information:** None.**After inhalation:**

Maintain an unobstructed airway.

Loosen clothing as necessary and position individual in a comfortable position.

**After skin contact:**

Wash affected area with soap and water.

**After eye contact:**

Rinse/flush exposed eye(s) gently using water for 15-20 minutes.

Remove contact lens(es) if able to do so during rinsing.

**After swallowing:**

Rinse mouth thoroughly. Seek medical attention if irritation, discomfort, or vomiting develops.

**5 Firefighting measures**

Effective date: 11 May 2023

Revision: 11 May 2023

Trade Name: Alconox® Powdered Precision Cleaner

**5.1 Extinguishing media****Suitable extinguishing agents:**

Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition.

**For safety reasons unsuitable extinguishing agents:** None**5.2 Special hazards arising from the substance or mixture:**

Thermal decomposition can lead to release of irritating gases and vapors.

**5.3 Advice for firefighters****Protective equipment:**

Wear protective eye wear, gloves and clothing.

Refer to Section 8.

**5.4 Additional information:**

Avoid inhaling gases, fumes, dust, mist, vapor and aerosols.

Avoid contact with skin, eyes and clothing.

**6 Accidental release measures****6.1 Personal precautions, protective equipment and emergency procedures:**

Ensure adequate ventilation.

Ensure air handling systems are operational.

**6.2 Environmental precautions:**

Should not be released into the environment.

Prevent from reaching drains, sewer or waterway.

**6.3 Methods and material for containment and cleaning up:**

Wear protective eye wear, gloves and clothing.

**6.4 Reference to other sections:** None**7 Handling and storage****7.1 Precautions for safe handling:**

No expected hazards under normal use condition.

Avoid breathing mist or vapor if aerosolized.

Do not eat, drink, smoke or use personal products when handling chemical substances.

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

Store in a cool, well-ventilated area.

**7.3 Specific end use(s):**

No additional information.

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## 8 Exposure controls/personal protection



## 8.1 Control parameters:

- a) 7722-88-5, Tetrasodium Pyrophosphate, ACGIH TWA 10 mg/m<sup>3</sup>
- b) 7758-29-4, Sodium Tripolyphosphate, ACGIH TWA 10 mg/m<sup>3</sup>
- c) Dusts, non-specific OEL, Irish Code of Practice
  - (i) Total inhalable 10 mg/m<sup>3</sup> (8hr)
  - (ii) Respirable 4 mg/m<sup>3</sup> (8hr)
  - (iii) Tetrasodium Pyrophosphate, OSHA TWA 5 mg/m<sup>3</sup>, (8hr)

## 8.2 Exposure controls

**Appropriate engineering controls:**

Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling.

**Respiratory protection:**

Not needed under normal use conditions.

**Protection of skin:**

Select glove material impermeable and resistant to the substance.

**Eye protection:**

Safety goggles or glasses, or appropriate eye protection. Recommended to comply with ANSI Z87.1 and/or EN 166.

**General hygienic measures:**

Wash hands before breaks and at the end of work.  
Avoid contact with skin, eyes and clothing.

**Exposure Control and Personal Protective Equipment at recommended dilution:**

Under normal use and operational conditions, no special personal protective equipment or engineering controls will be necessary. Handle with care.

## 9 Physical and chemical properties

|                                            |                                         |                                                                |                                                                      |
|--------------------------------------------|-----------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------|
| <b>Appearance (physical state, color):</b> | White and cream colored flakes - powder | <b>Explosion limit lower:</b><br><b>Explosion limit upper:</b> | Not determined or not available.<br>Not determined or not available. |
| <b>Odor:</b>                               | Not determined or not available.        | <b>Vapor pressure at 20°C:</b>                                 | Not determined or not available.                                     |
| <b>Odor threshold:</b>                     | Not determined or not available.        | <b>Vapor density:</b>                                          | Not determined or not available.                                     |
| <b>pH-value:</b>                           | 9.5 (1% aqueous solution)               | <b>Relative density:</b>                                       | Not determined or not available.                                     |

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|                                       |                                  |                                                 |                                                                                                |
|---------------------------------------|----------------------------------|-------------------------------------------------|------------------------------------------------------------------------------------------------|
| <b>Melting/Freezing point:</b>        | Not determined or not available. | <b>Solubilities:</b>                            | Not determined or not available.                                                               |
| <b>Boiling point/Boiling range:</b>   | Not determined or not available. | <b>Partition coefficient (n-octanol/water):</b> | Not determined or not available.                                                               |
| <b>Flash point (closed cup):</b>      | Not determined or not available. | <b>Auto/Self-ignition temperature:</b>          | Not determined or not available.                                                               |
| <b>Evaporation rate:</b>              | Not determined or not available. | <b>Decomposition temperature:</b>               | Not determined or not available.                                                               |
| <b>Flammability (solid, gaseous):</b> | Not determined or not available. | <b>Viscosity:</b>                               | a. Kinematic: Not determined or not available.<br>b. Dynamic: Not determined or not available. |
| <b>Density at 20°C:</b>               | Not determined or not available. |                                                 |                                                                                                |

**10 Stability and reactivity**

- 10.1 Reactivity:** Not determined or not available.  
**10.2 Chemical stability:** Not determined or not available.  
**10.3 Possibility hazardous reactions:** Not determined or not available.  
**10.4 Conditions to avoid:** Not determined or not available.  
**10.5 Incompatible materials:** Not determined or not available.  
**10.6 Hazardous decomposition products:** Not determined or not available.

**11 Toxicological information****11.1 Information on toxicological effects:****Acute Toxicity:****Oral:**

: LD50 &gt; 5000 mg/kg oral rat - Product.

**Chronic Toxicity:** No additional information.**Skin corrosion/irritation:**

Sodium Alkylbenzene Sulfonate: Causes skin irritation.

**Serious eye damage/irritation:**

Sodium Alkylbenzene Sulfonate: Causes serious eye damage.

Tetrasodium Pyrophosphate: Risk of serious damage to eyes.

**Product information at recommended dilution:**

Eye irritation may occur upon direct contact with eyes. No specific hazards for skin contact, inhalation, or chronic exposure are expected within normal use parameters.

**Respiratory or skin sensitization:** No additional information.**Carcinogenicity:** No additional information.**IARC (International Agency for Research on Cancer):** None of the ingredients are listed.**NTP (National Toxicology Program):** None of the ingredients are listed.**Germ cell mutagenicity:** No additional information.**Reproductive toxicity:** No additional information.

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**STOT-single and repeated exposure:** No additional information.**Additional toxicological information:** No additional information.**12 Ecological information****12.1 Toxicity:**

Sodium Alkylbenzene Sulfonate: Fish, LC50 1.67 mg/l, 96 hours.

Sodium Alkylbenzene Sulfonate: Aquatic invertebrates, EC50 Daphnia 2.9 mg/l, 48 hours.

Sodium Alkylbenzene Sulfonate: Aquatic Plants, EC50 Algae 29 mg/l, 96 hours.

Tetrasodium Pyrophosphate: Fish, LC50 - other fish - 1,380 mg/l - 96 h.

Tetrasodium Pyrophosphate: Aquatic invertebrates, EC50 - Daphnia magna (Water flea) - 391 mg/l - 48 h.

**12.2 Persistence and degradability:** No additional information.**12.3 Bioaccumulative potential:** No additional information.**12.4 Mobility in soil:** No additional information.**General notes:** No additional information.**12.5 Results of PBT and vPvB assessment:****PBT:** No additional information.**vPvB:** No additional information.**12.6 Other adverse effects:** No additional information.**13 Disposal considerations****13.1 Waste treatment methods (consult local, regional and national authorities for proper disposal)****Relevant Information:**

It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities. (US 40CFR262.11).

**14 Transport information****14.1 UN Number:** None  
ADR, ADN, DOT, IMDG, IATA**14.2 UN Proper shipping name:** None  
ADR, ADN, DOT, IMDG, IATA**14.3 Transport hazard classes:**  
ADR, ADN, DOT, IMDG, IATA  
**Class:** None  
**Label:** None  
**LTD. QTY:** None**US DOT**  
**Limited Quantity Exception:** None**Bulk:**  
**RQ (if applicable):** None  
**Proper shipping Name:** None  
**Hazard Class:** None  
**Packing Group:** None  
**Marine Pollutant (if applicable):** No additional information.**Non Bulk:**  
**RQ (if applicable):** None  
**Proper shipping Name:** None  
**Hazard Class:** None  
**Packing Group:** None  
**Marine Pollutant (if applicable):** No additional information.



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|                                                                                                      |                       |
|------------------------------------------------------------------------------------------------------|-----------------------|
| <b>Comments:</b> None                                                                                | <b>Comments:</b> None |
| <b>I4.4 Packing group:</b><br>ADR, ADN, DOT, IMDG, IATA                                              | None                  |
| <b>I4.5 Environmental hazards:</b>                                                                   | None                  |
| <b>I4.6 Special precautions for user:</b>                                                            | None                  |
| <b>Danger code (Kemler):</b>                                                                         | None                  |
| <b>EMS number:</b>                                                                                   | None                  |
| <b>Segregation groups:</b>                                                                           | None                  |
| <b>I4.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code:</b> Not applicable. |                       |
| <b>I4.8 Transport/Additional information:</b>                                                        |                       |
| <b>Transport category:</b>                                                                           | None                  |
| <b>Tunnel restriction code:</b>                                                                      | None                  |
| <b>UN "Model Regulation":</b>                                                                        | None                  |

**I5 Regulatory information****I5.1 Safety, health and environmental regulations/legislation specific for the substance or mixture.****North American****SARA****Section 313 (specific toxic chemical listings):** None of the ingredients are listed.**Section 302 (extremely hazardous substances):** None of the ingredients are listed.**CERCLA (Comprehensive Environmental Response, Clean up and Liability Act) Reportable****Spill Quantity:** None of the ingredients are listed.**TSCA (Toxic Substances Control Act):****Inventory:** All ingredients are listed as active.**Rules and Orders:** Not applicable.**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.**Canadian****Canadian Domestic Substances List (DSL):**

All ingredients are listed.

**EU****REACH Article 57 (SVHC):** None of the ingredients are listed.

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Trade Name: **Alconox® Powdered Precision Cleaner****Germany MAK:** Not classified.**EC 648/2004** – This is an industrial detergent. Contains >30% phosphate, 15-30% anionic surfactant, <5% EDTA salts**EC 551/2009** – This is not a laundry or dishwasher detergent**EC 907/2006** – Contains no enzymes, optical brighteners, perfumes, allergenic fragrances, or preservative agents**Asia Pacific****Australia****Australian Inventory of Chemical Substances (AICS):** All ingredients are listed.**China****Inventory of Existing Chemical Substances in China (IECSC):** All ingredients are listed.**Japan****Inventory of Existing and New Chemical Substances (ENCS):** All ingredients are listed.**Korea****Existing Chemicals List (ECL):** All ingredients are listed.**New Zealand****New Zealand Inventory of Chemicals (NZOIC):** All ingredients are listed.**Philippines****Philippine Inventory of Chemicals and Chemical Substances (PICCS):** All ingredients are listed.**Taiwan****Taiwan Chemical Substance Inventory (TSCI):** All ingredients are listed.**16 Other information****Abbreviations and Acronyms:** None**Summary of Phrases****Hazard statements:**

H315 Causes skin irritation.

H318 Causes serious eye damage.

**NFPA:** 1-0-0**HMIS:** 1-0-0**At recommended dilution:****NFPA:** 1-0-0**HMIS:** 1-0-0**Precautionary statements:**

P264 Wash skin thoroughly after handling.

P280 Wear protective gloves/protective clothing/eye protection/face protection.

P302+P352 If on skin: Wash with soap and water.

P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.

P321 Specific treatment (see supplemental first aid instructions on this label).

P332+P313 If skin irritation occurs: Get medical advice/attention.

P362 Take off contaminated clothing and wash before reuse.

P501 Dispose of contents and container as instructed in Section 13.

**Manufacturer Statement:**

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

## SAFETY DATA SHEET

Version 6.5  
Revision Date 08/03/2021  
Print Date 08/12/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : 2-Methylpyridine

Product Number : 109835

Brand : Aldrich

Index-No. : 613-036-00-2

CAS-No. : 109-06-8

**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)**

Flammable liquids (Category 3), H226

Acute toxicity, Oral (Category 4), H302

Acute toxicity, Inhalation (Category 4), H332

Acute toxicity, Dermal (Category 3), H311

Eye irritation (Category 2A), H319

Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

For the full text of the H-Statements mentioned in this Section, see Section 16.

**2.2 GHS Label elements, including precautionary statements**

Pictogram



|                            |                                                                                                                                                                |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Signal word                | Danger                                                                                                                                                         |
| Hazard statement(s)        |                                                                                                                                                                |
| H226                       | Flammable liquid and vapor.                                                                                                                                    |
| H302 + H332                | Harmful if swallowed or if inhaled.                                                                                                                            |
| H311                       | Toxic in contact with skin.                                                                                                                                    |
| H319                       | Causes serious eye irritation.                                                                                                                                 |
| H335                       | May cause respiratory irritation.                                                                                                                              |
| Precautionary statement(s) |                                                                                                                                                                |
| P210                       | Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.                                                                                            |
| P233                       | Keep container tightly closed.                                                                                                                                 |
| P240                       | Ground/bond container and receiving equipment.                                                                                                                 |
| P241                       | Use explosion-proof electrical/ ventilating/ lighting/ equipment.                                                                                              |
| P242                       | Use only non-sparking tools.                                                                                                                                   |
| P243                       | Take precautionary measures against static discharge.                                                                                                          |
| P261                       | Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray.                                                                                                          |
| P264                       | Wash skin thoroughly after handling.                                                                                                                           |
| P270                       | Do not eat, drink or smoke when using this product.                                                                                                            |
| P271                       | Use only outdoors or in a well-ventilated area.                                                                                                                |
| P280                       | Wear protective gloves/ eye protection/ face protection.                                                                                                       |
| P301 + P312 + P330         | IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth.                                                                                    |
| P303 + P361 + P353         | IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.                                                   |
| P304 + P340 + P312         | IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell. |
| P305 + P351 + P338         | IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.                               |
| P337 + P313                | If eye irritation persists: Get medical advice/ attention.                                                                                                     |
| P363                       | Wash contaminated clothing before reuse.                                                                                                                       |
| P370 + P378                | In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.                                                                          |
| P403 + P233                | Store in a well-ventilated place. Keep container tightly closed.                                                                                               |
| P403 + P235                | Store in a well-ventilated place. Keep cool.                                                                                                                   |
| P405                       | Store locked up.                                                                                                                                               |
| P501                       | Dispose of contents/ container to an approved waste disposal plant.                                                                                            |

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

---

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

|                  |                                   |
|------------------|-----------------------------------|
| Synonyms         | : 2-Picoline                      |
| Formula          | : C <sub>6</sub> H <sub>7</sub> N |
| Molecular weight | : 93.13 g/mol                     |
| CAS-No.          | : 109-06-8                        |
| EC-No.           | : 203-643-7                       |
| Index-No.        | : 613-036-00-2                    |

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| Component               | Classification                                                                                                                       | Concentration |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>2-methylpyridine</b> |                                                                                                                                      |               |
|                         | Flam. Liq. 3; Acute Tox. 4;<br>Acute Tox. 3; Skin Corr.<br>1C; Eye Dam. 1; STOT SE<br>3; H226, H302, H332,<br>H311, H314, H318, H335 | <= 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

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

#### If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

#### Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

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

Carbon oxides

Nitrogen oxides (NO<sub>x</sub>)

Combustible.

### 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

Wear respiratory protection. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapors accumulating to form explosive concentrations. Vapors can accumulate in low areas.

For personal protection see section 8.

### 6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

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

Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

### 6.4 Reference to other sections

For disposal see section 13.

---

## SECTION 7: Handling and storage

### 7.1 Precautions for safe handling

#### Advice on safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapor or mist.

#### Advice on protection against fire and explosion

Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

#### 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. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

#### Storage class

Storage class (TRGS 510): 3: Flammable liquids

### 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

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| Component        | CAS-No.  | Value | Control parameters | Basis                                               |
|------------------|----------|-------|--------------------|-----------------------------------------------------|
| 2-methylpyridine | 109-06-8 | TWA   | 2 ppm              | USA. Workplace Environmental Exposure Levels (WEEL) |
|                  | Remarks  | Skin  |                    |                                                     |
|                  |          | STEL  | 5 ppm              | USA. Workplace Environmental Exposure Levels (WEEL) |
|                  |          | 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.

Splash contact

Material: butyl-rubber

Minimum layer thickness: 0.3 mm

Break through time: 82 min

Material tested: Butoject® (KCL 897 / Aldrich Z677647, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the 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, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

#### Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

#### Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

---

## SECTION 9: Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

|                                                 |                                                                    |
|-------------------------------------------------|--------------------------------------------------------------------|
| a) Appearance                                   | Form: clear, liquid<br>Color: light yellow                         |
| b) Odor                                         | unpleasant                                                         |
| c) Odor Threshold                               | No data available                                                  |
| d) pH                                           | 8.5 at 100 g/l at 20 °C (68 °F)                                    |
| e) Melting point/freezing point                 | Melting point/range: -70 °C (-94 °F) - lit.                        |
| f) Initial boiling point and boiling range      | 128 - 129 °C 262 - 264 °F - lit.                                   |
| g) Flash point                                  | 29 °C (84 °F) - closed cup                                         |
| h) Evaporation rate                             | No data available                                                  |
| i) Flammability (solid, gas)                    | No data available                                                  |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 8.6 %(V)<br>Lower explosion limit: 1.4 %(V) |
| k) Vapor pressure                               | 14.9 hPa at 25 °C (77 °F)<br>13 hPa at 24.4 °C(75.9 °F)            |
| l) Vapor density                                | 3.22 - (Air = 1.0)                                                 |
| m) Density                                      | 0.943 g/cm <sup>3</sup> at 25 °C (77 °F) - lit.                    |
| Relative density                                | No data available                                                  |
| n) Water solubility                             | completely miscible                                                |
| o) Partition coefficient: n-octanol/water       | log Pow: 1.11                                                      |
| 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

|                        |                    |
|------------------------|--------------------|
| Relative vapor density | 3.22 - (Air = 1.0) |
|------------------------|--------------------|

---

## 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

Vapors may form explosive mixture with air.

## 10.4 Conditions to avoid

Heat, flames and sparks.

## 10.5 Incompatible materials

Oxidizing agents

## 10.6 Hazardous decomposition products

In the event of fire: see section 5

---

## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

#### Acute toxicity

LD50 Oral - Rat - male - > 950 mg/kg

(OECD Test Guideline 401)

LC50 Inhalation - Rat - male and female - 4 h - > 9.4 mg/l

(OECD Test Guideline 403)

LD50 Dermal - Rabbit - male and female - > 200 - < 316 mg/kg

(OECD Test Guideline 402)

No data available

#### Skin corrosion/irritation

Skin - Rabbit

Result: Corrosive - 4 h

Remarks: (ECHA)

#### Serious eye damage/eye irritation

Causes serious eye damage.

#### Respiratory or skin sensitization

No data available

#### Germ cell mutagenicity

No data available

Test Type: Ames test

Test system: Salmonella typhimurium

Metabolic activation: with and without metabolic activation

Method: Mutagenicity (Salmonella typhimurium - reverse mutation assay)

Result: negative

Test Type: Mutagenicity (mammal cell test):

Test system: Chinese hamster fibroblasts

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 476

Result: negative

#### Carcinogenicity

No data available

#### Reproductive toxicity

No data available

No data available

**Specific target organ toxicity - single exposure**

May cause respiratory irritation.

**Specific target organ toxicity - repeated exposure**

No data available

**Aspiration hazard**

No data available

**11.2 Additional Information**

RTECS: TJ4900000

Liver injury may occur., Kidney injury may occur., Cough, Shortness of breath, Headache, Nausea, Vomiting, 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 | semi-static test EC50 - Danio rerio (zebra fish) - > 560 - < 1,000 mg/l - 96 h<br>(OECD Test Guideline 203)<br>Remarks: (in analogy to similar products) |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                                     |                                                                                                                               |
|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Toxicity to daphnia and other aquatic invertebrates | EC50 - Daphnia magna (Water flea) - 320 mg/l - 48 h<br>(OECD Test Guideline 202)<br>Remarks: (in analogy to similar products) |
|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|

|                   |                                                                                                                                                                                                                                              |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Toxicity to algae | static test ErC50 - Pseudokirchneriella subcapitata (green algae) - 320 mg/l - 72 h<br>(OECD Test Guideline 201)<br>Remarks: (in analogy to similar products)<br>The value is given in analogy to the following substances: 3-methylpyridine |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                      |                                                                                                                                                                      |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Toxicity to bacteria | NOEC - activated sludge - 20 mg/l - 28 d<br>Remarks: (in analogy to similar products)<br>The value is given in analogy to the following substances: 3-methylpyridine |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**12.2 Persistence and degradability**

|                  |                                                                                                                                                                                                                    |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Biodegradability | aerobic - Exposure time 28 d<br>Result: 85 % - Readily biodegradable.<br>(OECD Test Guideline 301B)<br>Remarks: (in analogy to similar compounds)<br>The value is given in analogy to the following substances: 3- |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

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### 12.3 Bioaccumulative potential

No data available

### 12.4 Mobility in soil

No data available

### 12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

### 12.6 Other adverse effects

No data available

---

## SECTION 13: Disposal considerations

### 13.1 Waste treatment methods

#### Product

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.

---

## SECTION 14: Transport information

#### DOT (US)

UN number: 2313    Class: 3    Packing group: III  
Proper shipping name: Picolines  
Reportable Quantity (RQ): 5000 lbs  
Poison Inhalation Hazard: No

#### IMDG

UN number: 2313    Class: 3    Packing group: III    EMS-No: F-E, S-D  
Proper shipping name: PICOLINES

#### IATA

UN number: 2313    Class: 3    Packing group: III  
Proper shipping name: Picolines

---

## 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:

|                  |                     |                             |
|------------------|---------------------|-----------------------------|
| 2-methylpyridine | CAS-No.<br>109-06-8 | Revision Date<br>2007-03-01 |
|------------------|---------------------|-----------------------------|

#### **SARA 311/312 Hazards**

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

#### **Massachusetts Right To Know Components**

|                  |                     |                             |
|------------------|---------------------|-----------------------------|
| 2-methylpyridine | CAS-No.<br>109-06-8 | Revision Date<br>2007-03-01 |
|------------------|---------------------|-----------------------------|

#### **Pennsylvania Right To Know Components**

|                  |                     |                             |
|------------------|---------------------|-----------------------------|
| 2-methylpyridine | CAS-No.<br>109-06-8 | Revision Date<br>2007-03-01 |
|------------------|---------------------|-----------------------------|

#### **New Jersey Right To Know Components**

|                  |                     |                             |
|------------------|---------------------|-----------------------------|
| 2-methylpyridine | CAS-No.<br>109-06-8 | Revision Date<br>2007-03-01 |
|------------------|---------------------|-----------------------------|

---

### **SECTION 16: Other information**

#### **Further information**

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Version: 6.5

Revision Date: 08/03/2021

Print Date: 08/12/2023

## SAFETY DATA SHEET

Version 6.4  
Revision Date 06/06/2023  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Aluminum

Product Number : 653608

Brand : Aldrich

Index-No. : 013-001-00-6

CAS-No. : 7429-90-5

**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)**

Pyrophoric solids (Category 1), H250

Chemicals which, in contact with water, emit flammable gases (Category 2), H261

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)        |                                                                                      |
| H250                       | Catches fire spontaneously if exposed to air.                                        |
| H261                       | In contact with water releases flammable gas.                                        |
| Precautionary statement(s) |                                                                                      |
| P210                       | Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.                  |
| P222                       | Do not allow contact with air.                                                       |
| P223                       | Do not allow contact with water.                                                     |
| P231 + P232                | Handle under inert gas. Protect from moisture.                                       |
| P280                       | Wear protective gloves/ eye protection/ face protection.                             |
| P335 + P334                | Brush off loose particles from skin. Immerse in cool water/ wrap in wet bandages.    |
| P370 + P378                | In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish. |
| P402 + P404                | Store in a dry place. Store in a closed container.                                   |
| P422                       | Store contents under inert gas.                                                      |
| P501                       | Dispose of contents/ container to an approved waste disposal plant.                  |

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Combustible dust

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

|                  |                |
|------------------|----------------|
| Formula          | : Al           |
| Molecular weight | : 26.98 g/mol  |
| CAS-No.          | : 7429-90-5    |
| EC-No.           | : 231-072-3    |
| Index-No.        | : 013-001-00-6 |

| Component        | Classification             | Concentration |
|------------------|----------------------------|---------------|
| <b>aluminium</b> |                            |               |
|                  | Pyr. Sol. 1; 2; H250, H261 | <= 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.

**In case of skin contact**

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

**In case of eye contact**

After eye contact: rinse out with plenty of water. Remove contact lenses.

**If swallowed**

After swallowing: make victim drink water (two glasses at most). Consult doctor if feeling unwell.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

**SECTION 5: Firefighting measures****5.1 Extinguishing media****Suitable extinguishing media**

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

**Unsuitable extinguishing media**

Water Foam

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

Aluminum oxide

Not combustible.

May not get in touch with: Water

Ambient fire may liberate hazardous vapours.

**5.3 Advice for firefighters**

In the event of fire, wear self-contained breathing apparatus.

**5.4 Further information**

none

---

**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**

Risk of explosion. No special precautionary measures necessary.

**6.3 Methods and materials for containment and cleaning up**

Observe possible material restrictions (see sections 7 and 10). Take up dry. 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. Keep workplace dry. Do not allow product to come into contact with water.

#### Advice on protection against fire and explosion

Keep away from open flames, hot surfaces and sources of ignition.

#### Hygiene measures

Change contaminated clothing. Wash hands after working with substance.  
For precautions see section 2.2.

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

#### Storage conditions

Tightly closed. Keep away from heat and sources of ignition.  
Never allow product to get in contact with water during storage.

Store under inert gas.

#### Storage class

Storage class (TRGS 510): 4.2: Pyrophoric and self-heating 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                                                                                   |
|-----------|-----------|----------------------------------------|--------------------|-----------------------------------------------------------------------------------------|
| aluminium | 7429-90-5 | TWA                                    | 5 mg/m3            | USA. NIOSH Recommended Exposure Limits                                                  |
|           |           | TWA                                    | 10 mg/m3           | USA. NIOSH Recommended Exposure Limits                                                  |
|           |           | TWA                                    | 15 mg/m3           | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|           |           | TWA                                    | 5 mg/m3            | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|           |           | TWA                                    | 5 mg/m3            | USA. NIOSH Recommended Exposure Limits                                                  |
|           |           | PEL                                    | 5 mg/m3            | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|           |           | TWA                                    | 5 mg/m3            | USA. NIOSH Recommended Exposure Limits                                                  |
|           |           | PEL                                    | 5 mg/m3            | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|           |           | TWA                                    | 1 mg/m3            | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|           | Remarks   | Not classifiable as a human carcinogen |                    |                                                                                         |

## 8.2 Exposure controls

### Appropriate engineering controls

Change contaminated clothing. Wash hands after working with substance.

### Personal protective equipment

#### Eye/face protection

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

Flame retardant antistatic 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**

Risk of explosion. No special precautionary measures necessary.

---

## **SECTION 9: Physical and chemical properties**

### **9.1 Information on basic physical and chemical properties**

- |                                                 |                                                  |
|-------------------------------------------------|--------------------------------------------------|
| a) Appearance                                   | Form: powder                                     |
| b) Odor                                         | No data available                                |
| c) Odor Threshold                               | No data available                                |
| d) pH                                           | No data available                                |
| e) Melting point/freezing point                 | Melting point/range: 660.37 °C (1220.67 °F)      |
| f) Initial boiling point and boiling range      | 2,460 °C 4,460 °F                                |
| g) Flash point                                  | ( )Not applicable                                |
| h) Evaporation rate                             | No data available                                |
| i) Flammability (solid, gas)                    | May form combustible dust concentrations in air. |
| j) Upper/lower flammability or explosive limits | No data available                                |
| k) Vapor pressure                               | No data available                                |
| l) Vapor density                                | No data available                                |
| m) Density                                      | 2.7 g/mL at 25 °C (77 °F)                        |
| Relative density                                | No data available                                |
| n) Water solubility                             | No data available                                |
| o) Partition coefficient: n-octanol/water       | No data available                                |
| p) Autoignition temperature                     | Catches fire spontaneously if exposed to air.    |
| q) Decomposition                                | No data available                                |

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temperature

- r) Viscosity No data available
- s) Explosive properties No data available
- t) Oxidizing properties none

## 9.2 Other safety information

No data available

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

Sensitive to air.

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to avoid

Do not allow water to enter container.  
Exposure to air.  
Moisture.

### 10.5 Incompatible materials

acids, Acid chlorides, Halogens, Oxidizing agents, Bases, Oxygen

### 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

Oral: No data available

Inhalation: No data available

Dermal: No data available

#### Skin corrosion/irritation

No data available

#### Serious eye damage/eye irritation

No data available

#### Respiratory or skin 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

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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

**11.2 Additional Information**

RTECS: BD0330000

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

---

**SECTION 12: Ecological information**

**12.1 Toxicity**

No data available

**12.2 Persistence and degradability**

No data available

**12.3 Bioaccumulative potential**

Bioaccumulation      Salvelinus fontinalis - 56 d  
                                         - 268 µg/l(aluminium)

Bioconcentration factor (BCF): 36

**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 Endocrine disrupting properties**

No data available

**12.7 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.

---

## SECTION 14: Transport information

#### DOT (US)

UN number: 1396    Class: 4.3    Packing group: II  
Proper shipping name: Aluminum powder, uncoated  
Reportable Quantity (RQ):  
Poison Inhalation Hazard: No

#### IMDG

UN number: 1396    Class: 4.3    Packing group: II EMS-No: F-G, S-O  
Proper shipping name: ALUMINIUM POWDER, UNCOATED

#### IATA

UN number: 1396    Class: 4.3    Packing group: II  
Proper shipping name: Aluminium powder, uncoated

---

## 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 |
|-----------|-----------|---------------|
| aluminium | 7429-90-5 | 1993-02-16    |

#### SARA 311/312 Hazards

Reactivity Hazard

#### Massachusetts Right To Know Components

|           | CAS-No.   | Revision Date |
|-----------|-----------|---------------|
| aluminium | 7429-90-5 | 1993-02-16    |

#### Pennsylvania Right To Know Components

|           | CAS-No.   | Revision Date |
|-----------|-----------|---------------|
| aluminium | 7429-90-5 | 1993-02-16    |

---

## 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: 06/06/2023

Print Date: 10/07/2023

## SAFETY DATA SHEET

Version 6.7  
Revision Date 06/15/2023  
Print Date 08/12/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Ammonia

Product Number : 294993  
Brand : Aldrich  
Index-No. : 007-001-00-5  
CAS-No. : 7664-41-7

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

Company : Sigma-Aldrich 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 gases (Category 2), H221  
Gases under pressure (Liquefied gas), H280  
Acute toxicity, Inhalation (Category 3), H331  
Skin corrosion (Category 1B), H314  
Serious eye damage (Category 1), H318  
Short-term (acute) aquatic hazard (Category 1), H400  
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**

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Pictogram



Signal Word

Danger

Hazard statement(s)

H221 Flammable gas.  
H280 Contains gas under pressure; may explode if heated.  
H314 Causes severe skin burns and eye damage.  
H331 Toxic if inhaled.  
H400 Very toxic to aquatic life.  
H411 Toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P210 Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.  
P260 Do not breathe gas.  
P264 Wash skin thoroughly after handling.  
P271 Use only outdoors or in a well-ventilated area.  
P273 Avoid release to the environment.  
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.  
P301 + P330 + P331 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.  
P303 + P361 + P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.  
P304 + P340 + P310 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor.  
P305 + P351 + P338 + P310 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/ doctor.  
P363 Wash contaminated clothing before reuse.  
P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely.  
P381 Eliminate all ignition sources if safe to do so.  
P391 Collect spillage.  
P403 + P233 Store in a well-ventilated place. Keep container tightly closed.  
P405 Store locked up.  
P410 + P403 Protect from sunlight. Store in a well-ventilated place.  
P501 Dispose of contents/ container to an approved waste disposal plant.

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Corrosive to the respiratory tract.

---

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Formula :  $\text{H}_3\text{N}$   
Molecular weight : 17.03 g/mol  
CAS-No. : 7664-41-7  
EC-No. : 231-635-3  
Index-No. : 007-001-00-5

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| Component                | Classification                                                                                                                                                                               | Concentration |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>ammonia anhydrous</b> |                                                                                                                                                                                              |               |
|                          | Flam. Gas 2; Press. Gas Liquefied gas; Acute Tox. 3; Skin Corr. 1B; Eye Dam. 1; Aquatic Acute 1; Aquatic Chronic 2; H221, H280, H331, H314, H318, H400, H411<br>M-Factor - Aquatic Acute: 10 | <= 100 %      |

For the full text of the H-Statements mentioned in this Section, see Section 16.

---

## SECTION 4: First aid measures

### 4.1 Description of first-aid measures

#### General advice

First aiders need to protect themselves. Show this material safety data sheet to the doctor in attendance.

#### If inhaled

After inhalation: fresh air. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

#### In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Call a physician immediately.

#### In case of eye contact

After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist. Remove contact lenses.

#### If swallowed

After swallowing: make victim drink water (two glasses at most), avoid vomiting (risk of perforation). Call a physician immediately. Do not attempt to neutralise.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

#### Suitable extinguishing media

Carbon dioxide (CO<sub>2</sub>) Foam Dry powder

## **Unsuitable extinguishing media**

Water

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

Nitrogen oxides (NO<sub>x</sub>)

Not combustible.

Pay attention to flashback.

Ambient fire may liberate hazardous vapours.

### **5.3 Advice for firefighters**

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

### **5.4 Further information**

Remove container from danger zone and cool with water. Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

---

## **SECTION 6: Accidental release measures**

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

Advice for non-emergency personnel: Do not breathe gas. 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). Stop flow of gas, move leaking cylinder to open air if without risk.

### **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. Avoid generation of vapours/aerosols.

#### **Advice on protection against fire and explosion**

Keep away from open flames, hot surfaces and sources of ignition.

#### **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**

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Tightly closed. Keep locked up or in an area accessible only to qualified or authorized persons. Keep away from combustible materials and sources of ignition.

Contents under pressure.

#### **Storage class**

Storage class (TRGS 510): 2A: Gases

### **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                                                                                   |
|-------------------|-----------|-------|--------------------------------|-----------------------------------------------------------------------------------------|
| ammonia anhydrous | 7664-41-7 | TWA   | 50 ppm<br>35 mg/m <sup>3</sup> | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|                   |           | PEL   | 25 ppm<br>18 mg/m <sup>3</sup> | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|                   |           | STEL  | 35 ppm<br>27 mg/m <sup>3</sup> | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|                   |           | TWA   | 25 ppm                         | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|                   |           | STEL  | 35 ppm                         | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|                   |           | TWA   | 25 ppm<br>18 mg/m <sup>3</sup> | USA. NIOSH Recommended Exposure Limits                                                  |
|                   |           | ST    | 35 ppm<br>27 mg/m <sup>3</sup> | USA. NIOSH Recommended Exposure Limits                                                  |

### **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: butyl-rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Butoject® (KCL 898)

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: butyl-rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Butoject® (KCL 898)

### **Body Protection**

Flame retardant antistatic 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: Liquefied gas<br>Color: colorless                           |
| b) Odor                                    | stinging, Do not attempt to smell the product as it is hazardous. |
| c) Odor Threshold                          | 0.02 ppm                                                          |
| d) pH                                      | ca.10 - 12 at 50 g/l at 20 °C (68 °F)                             |
| e) Melting point/freezing point            | Melting point/range: -78 °C (-108 °F) - lit.                      |
| f) Initial boiling point and boiling range | -33 °C -27 °F - lit.                                              |
| g) Flash point                             | ( )Not applicable                                                 |
| h) Evaporation rate                        | Not applicable                                                    |
| i) Flammability (solid, gas)               | The product is not flammable.                                     |
| j) Upper/lower flammability or             | Upper explosion limit: 25 %(V)<br>Lower explosion limit: 16 %(V)  |

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explosive limits

- |    |                                           |                                                    |
|----|-------------------------------------------|----------------------------------------------------|
| k) | Vapor pressure                            | 8,600 hPa at 20 °C (68 °F)                         |
| l) | Vapor density                             | 0.6 - (Air = 1.0)                                  |
| m) | Density                                   | 0.7 g/cm <sup>3</sup> at -33 °C (-27 °F) - liquid  |
|    | Relative density                          | No data available                                  |
| n) | Water solubility                          | 531 g/l at 20 °C (68 °F) - OECD Test Guideline 105 |
| o) | Partition coefficient:<br>n-octanol/water | Not applicable for inorganic substances            |
| p) | Autoignition<br>temperature               | 651 °C (1204 °F)                                   |
| q) | Decomposition<br>temperature              | > 450 °C (> 842 °F) -                              |
| r) | Viscosity                                 | No data available                                  |
| s) | Explosive properties                      | No data available                                  |
| t) | Oxidizing properties                      | none                                               |

## 9.2 Other safety information

- |                                  |                       |
|----------------------------------|-----------------------|
| Dissociation constant            | 9.25 at 25 °C (77 °F) |
| Relative vapor<br>density        | 0.6 - (Air = 1.0)     |
| Oxidation-reduction<br>Potential | -3,090 mV             |

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

### 10.3 Possibility of hazardous reactions

Exothermic reaction with:

Acetaldehyde  
Acrolein  
boron triiodide  
boron trifluoride  
Bromine  
hydrogen bromide  
Hydrogen chloride gas  
chromyl chloride  
dimethylsulfate  
nitrogen oxides  
Hydrogen fluoride  
Carbon dioxide (CO<sub>2</sub>)

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mercaptans  
chlorates  
nitryl compounds  
Phosgene  
Oxides of phosphorus  
Acids  
hydrogen sulphide  
sulphur dioxide  
chromium(VI) oxide  
metal catalysts  
Barium  
halogen-halogen compounds  
halogen compounds  
hypochlorous acid  
phosphorus hydrogen  
tetra methylammonium amide  
propinyl chloride  
Ethylene oxide  
polymerization

A risk of explosion and/or of toxic gas formation exists with the following substances:

Ammonium salts  
antimony hydride  
Calcium  
Chlorine  
Chlorites  
Fluorine  
halogens  
perchlorates  
sodium hypochlorite  
strong oxidising agents  
Mercury  
mercury compounds  
sulfur  
silver  
silver salt  
silver oxide  
hydrogen peroxide  
nitrogen trichloride  
azides  
halogen oxides  
Nitro compounds  
chlorinated solvents  
Hydrocarbons  
with  
Air  
Oxygen  
with  
Catalyst  
Risk of ignition or formation of inflammable gases or vapours with:  
Boron  
Boranes  
Nitric acid  
silicon-hydrogen

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Generates dangerous gases or fumes in contact with:  
Carbon monoxide  
with  
heat  
Possible formation of:  
Hydrogen cyanide (hydrocyanic acid)

#### **10.4 Conditions to avoid**

no information available

#### **10.5 Incompatible materials**

various metals

#### **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**

Oral: No data available

LC50 Inhalation - Rat - male - 4 h - 4.93 mg/l - vapor

Remarks: (ECHA)

Dermal: No data available

##### **Skin corrosion/irritation**

Skin - Rabbit

Result: Corrosive - 4 h

(OECD Test Guideline 404)

Remarks: (Regulation (EC) No 1272/2008, Annex VI)

##### **Serious eye damage/eye irritation**

Remarks: Causes serious eye damage.

##### **Respiratory or skin sensitization**

No data available

##### **Germ cell mutagenicity**

Test Type: Ames test

Test system: Escherichia coli/Salmonella typhimurium

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 471

Result: negative

Test Type: Micronucleus test

Species: Mouse

Cell type: Bone marrow

Application Route: Intraperitoneal

Method: OECD Test Guideline 474

Result: negative

Remarks: (in analogy to similar products)

The value is given in analogy to the following substances: ammonium chloride

### **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

## **11.2 Additional Information**

Repeated dose toxicity - Rat - male and female - Oral - 35 Days - NOAEL (No observed adverse effect level) - 250 mg/kg - LOAEL (Lowest observed adverse effect level) - 750 mg/kg

Remarks: (in analogy to similar products)

The value is given in analogy to the following substances: diammonium hydrogenphosphate

RTECS: B00875000

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

Liver - Irregularities - Based on Human Evidence

Liver - Irregularities - Based on Human Evidence

---

## **SECTION 12: Ecological information**

### **12.1 Toxicity**

|                                                     |                                                                                                                                                                                                                       |
|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Toxicity to fish                                    | flow-through test LC50 - Pimephales promelas (fathead minnow) - 0.068 mg/l - 96 h<br>Remarks: (in analogy to similar products) (ECHA)<br>The value is given in analogy to the following substances: ammonium sulphate |
| Toxicity to daphnia and other aquatic invertebrates | static test LC50 - Daphnia magna (Water flea) - 101 mg/l - 48 h<br>Remarks: (ECHA)<br><br>EC50 - Daphnia pulicaria - 1.16 mg/l - 48 h<br>Remarks: (Lit.)                                                              |

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|                                                                       |                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Toxicity to fish(Chronic toxicity)                                    | flow-through test NOEC - Ictalurus punctatus - 0.048 mg/l - 31 d (OECD Test Guideline 215)                                                                                                                                  |
| Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity) | <p>flow-through test LC50 - Daphnia magna (Water flea) - 4.07 mg/l - 96 h (US-EPA)</p> <p>Remarks: (in analogy to similar products)</p> <p>The value is given in analogy to the following substances: ammonium chloride</p> |
|                                                                       | <p>flow-through test NOEC - Daphnia magna (Water flea) - 0.79 mg/l - 96 h (US-EPA)</p> <p>Remarks: (in analogy to similar products)</p> <p>The value is given in analogy to the following substances: ammonium chloride</p> |

## 12.2 Persistence and degradability

Biodegradability      Result: - rapidly biodegradable  
Remarks: Readily biodegradable.

## 12.3 Bioaccumulative potential

No data available

## 12.4 Mobility in soil

No data available

## 12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

## 12.6 Endocrine disrupting properties

No data available

## 12.7 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. Pressurised gas bottle: dispose of only in empty condition!

---

## SECTION 14: Transport information

### DOT (US)

UN number: 1005 Class: 2.3 (8)  
Proper shipping name: Ammonia, anhydrous  
Reportable Quantity (RQ): 100 lbs  
Marine pollutant: yes  
Hazard Zone D

Poison Inhalation Hazard:

### IMDG

UN number: 1005 Class: 2.3 (8)  
Proper shipping name: AMMONIA, ANHYDROUS  
Marine pollutant : yes  
Marine pollutant : yes

EMS-No: F-C, S-U

### IATA

UN number: 1005 Class: 2.3 (8)  
Proper shipping name: Ammonia, anhydrous  
IATA Passenger: Not permitted for transport  
IATA Cargo: Not permitted for transport

---

## SECTION 15: Regulatory information

### SARA 302 Components

ammonia anhydrous

CAS-No.  
7664-41-7

Revision Date  
1993-04-24

### SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

ammonia anhydrous

CAS-No.  
7664-41-7

Revision Date  
1993-04-24

### SARA 311/312 Hazards

Sudden Release of Pressure Hazard, Acute Health Hazard, Chronic Health Hazard

### Massachusetts Right To Know Components

ammonia anhydrous

CAS-No.  
7664-41-7

Revision Date  
1993-04-24

### Pennsylvania Right To Know Components

ammonia anhydrous

CAS-No.  
7664-41-7

Revision Date  
1993-04-24

---

## 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: 6.7

Revision Date: 06/15/2023

Print Date: 08/12/2023

## SAFETY DATA SHEET

Version 6.7  
Revision Date 04/18/2021  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Antimony

Product Number : 266329  
Brand : Aldrich  
CAS-No. : 7440-36-0

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

Company : Sigma-Aldrich 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)**

Carcinogenicity (Category 2), H351  
Specific target organ toxicity - repeated exposure, Inhalation (Category 2), Lungs, H373  
Short-term (acute) aquatic hazard (Category 3), H402

For the full text of the H-Statements mentioned in this Section, see Section 16.

**2.2 GHS Label elements, including precautionary statements**

Pictogram



Signal word : Warning

Hazard statement(s)  
H351 : Suspected of causing cancer.

|                            |                                                                                       |
|----------------------------|---------------------------------------------------------------------------------------|
| H373                       | May cause damage to organs (Lungs) through prolonged or repeated exposure if inhaled. |
| H402                       | Harmful to aquatic life.                                                              |
| Precautionary statement(s) |                                                                                       |
| P201                       | Obtain special instructions before use.                                               |
| P202                       | Do not handle until all safety precautions have been read and understood.             |
| P260                       | Do not breathe dust/ fume/ gas/ mist/ vapors/ spray.                                  |
| P273                       | Avoid release to the environment.                                                     |
| P280                       | Wear protective gloves/ protective clothing/ eye protection/ face protection.         |
| P308 + P313                | IF exposed or concerned: Get medical advice/ attention.                               |
| 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          | : Sb           |
| Molecular weight | : 121.76 g/mol |
| CAS-No.          | : 7440-36-0    |
| EC-No.           | : 231-146-5    |

| Component       | Classification                                              | Concentration |
|-----------------|-------------------------------------------------------------|---------------|
| <b>antimony</b> |                                                             |               |
|                 | Carc. 2; STOT RE 2;<br>Aquatic Acute 3; H351,<br>H373, H402 | <= 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**

After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

**SECTION 5: Firefighting measures****5.1 Extinguishing media****Suitable extinguishing media**

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

**Unsuitable extinguishing media**

For this substance/mixture no limitations of extinguishing agents are given.

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

Nature of decomposition products not known.

Not combustible.

Ambient fire may liberate hazardous vapours.

**5.3 Advice for firefighters**

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

**5.4 Further information**

Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

---

**SECTION 6: Accidental release measures****6.1 Personal precautions, protective equipment and emergency procedures**

Advice for non-emergency personnel: 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 dry. 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.

Air sensitive. Moisture sensitive. Handle and store under inert gas.

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

| Component | CAS-No.   | Value | Control parameters    | Basis                                                                                   |
|-----------|-----------|-------|-----------------------|-----------------------------------------------------------------------------------------|
| antimony  | 7440-36-0 | TWA   | 0.5 mg/m <sup>3</sup> | USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000                           |
|           |           | TWA   | 0.5 mg/m <sup>3</sup> | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|           |           | TWA   | 0.5 mg/m <sup>3</sup> | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|           |           | TWA   | 0.5 mg/m <sup>3</sup> | USA. NIOSH Recommended Exposure Limits                                                  |
|           |           | PEL   | 0.5 mg/m <sup>3</sup> | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |

### 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: powder                                 |
| b) Odor                                         | odorless                                     |
| c) Odor Threshold                               | No data available                            |
| d) pH                                           | No data available                            |
| e) Melting point/freezing point                 | Melting point/range: 630 °C (1166 °F) - lit. |
| f) Initial boiling point and boiling range      | 1,635 °C 2,975 °F - lit.                     |
| g) Flash point                                  | ( )Not applicable                            |
| h) Evaporation rate                             | No data available                            |
| i) Flammability (solid, gas)                    | The product is not flammable.                |
| j) Upper/lower flammability or explosive limits | No data available                            |
| k) Vapor pressure                               | No data available                            |

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|                                           |                                                                      |
|-------------------------------------------|----------------------------------------------------------------------|
| l) Vapor density                          | No data available                                                    |
| m) Relative density                       | 7.05 at 21.8 °C (71.2 °F) - OECD Test Guideline 109                  |
| n) Water solubility                       | 17.1 g/l at 20 °C (68 °F) - OECD Test Guideline 105 - partly soluble |
| o) Partition coefficient: n-octanol/water | Not applicable for inorganic substances                              |
| p) Autoignition temperature               | No data available                                                    |
| q) Decomposition temperature              | No data available                                                    |
| r) Viscosity                              | No data available                                                    |
| s) Explosive properties                   | No data available                                                    |
| t) Oxidizing properties                   | No data available                                                    |

## 9.2 Other safety information

No data available

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to avoid

no information available

### 10.5 Incompatible materials

Strong acids

### 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

No data available

LC50 Inhalation - Rat - male and female - 4 h - > 5.2 mg/l  
(OECD Test Guideline 403)

LD50 Dermal - Rabbit - > 8,300 mg/kg

Remarks: (ECHA)

No data available

**Skin corrosion/irritation**

Skin - Rabbit

Result: No skin irritation - 7 d

Remarks: (ECHA)

**Serious eye damage/eye irritation**

Eyes - Rabbit

Result: No eye irritation

(OECD Test Guideline 405)

**Respiratory or skin sensitization**

Maximization Test - Guinea pig

Result: Not a skin sensitizer.

(OECD Test Guideline 406)

**Germ cell mutagenicity**

No data available

**Carcinogenicity**

Suspected of causing cancer.

IARC: No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

**Reproductive toxicity**

No data available

**Specific target organ toxicity - single exposure**

No data available

**Specific target organ toxicity - repeated exposure**

Inhalation - The substance or mixture is classified as specific target organ toxicant, repeated exposure, category 2. - Lungs

**Aspiration hazard**

No data available

**11.2 Additional Information**

Repeated dose toxicity - Mouse - male and female - Inhalation - 2 yr

RTECS: CC4025000

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                                    | static test LC50 - Pimephales promelas (fathead minnow) - 14.4 mg/l - 96 h<br>Remarks: (ECHA)                 |
| Toxicity to daphnia and other aquatic invertebrates | EC50 - Daphnia magna (Water flea) - 423.45 mg/l - 48 h<br>Remarks: (ECOTOX Database)                          |
| Toxicity to algae                                   | static test ErC50 - Pseudokirchneriella subcapitata (algae) - > 36.6 mg/l - 72 h<br>(OECD Test Guideline 201) |
| Toxicity to bacteria                                | static test EC50 - activated sludge - 27 mg/l - 4 h<br>(ISO 9509)                                             |

### 12.2 Persistence and degradability

The methods for determining biodegradability are not applicable to inorganic substances.

### 12.3 Bioaccumulative potential

No data available

### 12.4 Mobility in soil

No data available

### 12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

### 12.6 Other adverse effects

No data available

---

## SECTION 13: Disposal considerations

### 13.1 Waste treatment methods

#### Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See [www.retrologistik.com](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: 2871    Class: 6.1    Packing group: III

Proper shipping name: Antimony powder

Reportable Quantity (RQ): 5000 lbs

Poison Inhalation Hazard: No

### IMDG

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UN number: 2871    Class: 6.1    Packing group: III    EMS-No: F-A, S-A  
Proper shipping name: ANTIMONY POWDER  
Marine pollutant : yes

**IATA**

UN number: 2871    Class: 6.1    Packing group: III  
Proper shipping name: Antimony powder

---

**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:

|          |                      |                             |
|----------|----------------------|-----------------------------|
| antimony | CAS-No.<br>7440-36-0 | Revision Date<br>2007-07-01 |
|----------|----------------------|-----------------------------|

**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**

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: 6.7    Revision Date: 04/18/2021    Print Date: 10/07/2023

## SAFETY DATA SHEET

Version 6.5  
Revision Date 02/07/2023  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Arsenic

Product Number : 202657  
Brand : Aldrich  
Index-No. : 033-001-00-X  
CAS-No. : 7440-38-2

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

Company : Sigma-Aldrich 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 3), H331  
Skin irritation (Category 2), H315  
Serious eye damage (Category 1), H318  
Carcinogenicity (Category 1A), H350  
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 + H331

Toxic if swallowed or if inhaled.

H315

Causes skin irritation.

H318

Causes serious eye damage.

H350

May cause cancer.

H410

Very toxic to aquatic life with long lasting effects.

## Precautionary statement(s)

P201

Obtain special instructions before use.

P202

Do not handle until all safety precautions have been read and understood.

P261

Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray.

P264

Wash skin thoroughly after handling.

P270

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

P271

Use only outdoors or in a well-ventilated area.

P273

Avoid release to the environment.

P280

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

P301 + P310 + P330

IF SWALLOWED: Immediately call a POISON CENTER/ doctor. Rinse mouth.

P302 + P352

IF ON SKIN: Wash with plenty of soap and water.

P304 + P340 + P311

IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor.

P305 + P351 + P338 +

P310

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/ doctor.

P308 + P313

IF exposed or concerned: Get medical advice/ attention.

P332 + P313

If skin irritation occurs: Get medical advice/ attention.

P362

Take off contaminated clothing and wash before reuse.

P391

Collect spillage.

P403 + P233

Store in a well-ventilated place. Keep container tightly closed.

P405

Store locked up.

P501

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

## 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Formula : As  
Molecular weight : 74.92 g/mol  
CAS-No. : 7440-38-2  
EC-No. : 231-148-6  
Index-No. : 033-001-00-X

| Component      | Classification               | Concentration |
|----------------|------------------------------|---------------|
| <b>arsenic</b> |                              |               |
|                | Acute Tox. 3; Skin Irrit. 2; | <= 100 %      |

|  |                                                                                                                                                                                       |  |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  | Eye Dam. 1; Carc. 1A;<br>Aquatic Acute 1; Aquatic<br>Chronic 1; H301, H331,<br>H315, H318, H350, H400,<br>H410<br>M-Factor - Aquatic Acute:<br>10<br>M-Factor - Aquatic<br>Chronic: 1 |  |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

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. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

#### In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

#### In case of eye contact

After eye contact: rinse out with plenty of water. 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.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

#### Suitable extinguishing media

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

#### Unsuitable extinguishing media

For this substance/mixture no limitations of extinguishing agents are given.

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

Nature of decomposition products not known.

Not combustible.

Ambient fire may liberate hazardous vapours.

## **5.3 Advice for firefighters**

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

## **5.4 Further information**

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                                   |
|-----------|-----------|--------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-----------------------------------------|
| arsenic   | 7440-38-2 | TWA                                                                                                                                  | 0.01 mg/m <sup>3</sup>   | USA. ACGIH Threshold Limit Values (TLV) |
|           | Remarks   | Lung cancer<br>Substances for which there is a Biological Exposure Index or Indices (see BEI® section)<br>Confirmed human carcinogen |                          |                                         |
|           |           | C                                                                                                                                    | 0.0020 mg/m <sup>3</sup> | USA. NIOSH Recommended Exposure Limits  |
|           |           | Potential Occupational Carcinogen<br>See Appendix A<br>15 minute ceiling value                                                       |                          |                                         |

#### Biological occupational exposure limits

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

### 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: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: KCL 741 Dermatrill® L

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: 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: powder<br>Color: gray                                                 |
| b) Odor                                         | No data available                                                           |
| c) Odor Threshold                               | No data available                                                           |
| d) pH                                           | No data available                                                           |
| e) Melting point/freezing point                 | Melting point/range: 817 °C (1503 °F) - lit.                                |
| f) Initial boiling point and boiling range      | 613 °C 1135 °F - lit.                                                       |
| g) Flash point                                  | ( )Not applicable                                                           |
| h) Evaporation rate                             | No data available                                                           |
| i) Flammability (solid, gas)                    | No data available                                                           |
| j) Upper/lower flammability or explosive limits | No data available                                                           |
| k) Vapor pressure                               | No data available                                                           |
| l) Vapor density                                | No data available                                                           |
| m) Density                                      | 5.727 g/mL at 25 °C (77 °F) - lit.                                          |
| Relative density                                | 5.622.4 °C - OECD Test Guideline 109                                        |
| n) Water solubility                             | ca.0.0106 g/l at 20 °C (68 °F) - OECD Test Guideline 105 - slightly soluble |
| o) Partition coefficient: n-octanol/water       | Not applicable for inorganic substances                                     |

- |                              |                                     |
|------------------------------|-------------------------------------|
| p) Autoignition temperature  | > 430 °C (> 806 °F) does not ignite |
| q) Decomposition temperature | No data available                   |
| r) Viscosity                 | No data available                   |
| s) Explosive properties      | No data available                   |
| t) Oxidizing properties      | none                                |

## 9.2 Other safety information

No data available

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

### 10.3 Possibility of hazardous reactions

Exothermic reaction with:

Aluminum

Bromine

bromates

chlorates

iodates

Nitric acid

Risk of ignition or formation of inflammable gases or vapours with:

nitrates

Alkali metals

Zinc

Reducing agents

Strong oxidizing agents

Risk of explosion with:

potassium permanganate

azides

halogen-halogen compounds

Peroxides

nitrogen trichloride

### 10.4 Conditions to avoid

Heat. Exposure to air may affect product quality.

no information available

### 10.5 Incompatible materials

No data available

### 10.6 Hazardous decomposition products

In the event of fire: see section 5

---

## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

#### Acute toxicity

LD50 Oral - Mouse - 145 mg/kg

Remarks: Behavioral:Ataxia.

Diarrhea

(RTECS)

Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Inhalation: No data available

Dermal: No data available

No data available

#### Skin corrosion/irritation

Skin - In vitro study

Result: Irritating to skin. - 15 min

Remarks: (ECHA)

#### Serious eye damage/eye irritation

Eyes - Rabbit

Result: Causes serious eye damage. - 24 h

(OECD Test Guideline 405)

#### Respiratory or skin sensitization

Maximization Test - Guinea pig

Result: negative

(OECD Test Guideline 406)

#### Germ cell mutagenicity

Test Type: Ames test

Test system: Escherichia coli

Result: negative

Remarks: (ECHA)

#### Carcinogenicity

May cause cancer. Positive evidence from human epidemiological studies.

IARC: 1 - Group 1: Carcinogenic to humans (arsenic)

NTP: Known - Known to be human carcinogen (arsenic)

OSHA: OSHA specifically regulated carcinogen (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

### 11.2 Additional Information

RTECS: CG0525000

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

The following applies to arsenic and its compounds in general: they take effect as capillary and enzyme toxins. Symptoms of arsenic poisoning: acute: after inhalation, mucosal irritations with coughing, dyspnoea, pain in the thorax. Perforations within the respiratory tract are possible. After oral uptake, gastrointestinal disorders with vomiting, diarrhoea, and spasms, CNS disorders with headache, confusion, shaking fits and disturbed consciousness, cardiovascular disorders all the way to circulatory collapse. Chronic: exanthema, dermal lesions in the form of hyperkeratosis and hypermelanosis, loss of hair, conjunctivitis and polyneuropathy, impaired hepatic function, and renal damage. After accumulation in the liver, kidneys, and skin, arsenic is eliminated from the organism only slowly. Experience has shown arsenic compounds to be carcinogenic in man.

Other dangerous properties can not be excluded.

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>Oreochromis mossambicus</i> (Mozambique tilapia) - 28.68 mg/l - 96 h<br>Remarks: (ECHA) |
| Toxicity to daphnia and other aquatic invertebrates                   | static test EC50 - <i>Bosmina longirostris</i> (water flea) - 0.85 mg/l - 48 h<br>Remarks: (ECHA)             |
| Toxicity to algae                                                     | static test NOEC - <i>Macrocystis pyrifera</i> (brown algae) - 0.04 mg/l - 42 h<br>Remarks: (ECHA)            |
| Toxicity to bacteria                                                  | static test EC50 - activated sludge - 10.6 mg/l - 10 Days<br>Remarks: (ECHA)                                  |
| Toxicity to fish(Chronic toxicity)                                    | flow-through test NOEC - <i>Pimephales promelas</i> (fathead minnow) - 2.13 mg/l - 35 d<br>Remarks: (ECHA)    |
| Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity) | flow-through test NOEC - Shrimp - 0.631 mg/l - 51 d<br>Remarks: (ECHA)                                        |

### 12.2 Persistence and degradability

The methods for determining biodegradability are not applicable to inorganic substances.

### 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 Endocrine disrupting properties

No data available

### 12.7 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.

---

## SECTION 14: Transport information

#### DOT (US)

UN number: 1558    Class: 6.1    Packing group: II  
Proper shipping name: Arsenic  
Reportable Quantity (RQ): 1 lbs  
Reportable Quantity (RQ): 1 lbs  
Poison Inhalation Hazard: No

#### IMDG

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

#### IATA

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

---

## 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:

arsenic

CAS-No.  
7440-38-2

Revision Date  
2015-11-23

**SARA 311/312 Hazards**

Acute Health Hazard, Chronic Health Hazard

**Reportable Quantity** : D004 lbs**Massachusetts Right To Know Components**

arsenic

CAS-No.  
7440-38-2Revision Date  
2015-11-23**Pennsylvania Right To Know Components**

arsenic

CAS-No.  
7440-38-2Revision Date  
2015-11-23**California Prop. 65 Components**

, which is/are known to the State of California to  
cause cancer. For more information go to  
[www.P65Warnings.ca.gov/arsenic](http://www.P65Warnings.ca.gov/arsenic)

CAS-No.  
7440-38-2Revision Date  
2007-09-28

---

**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: 02/07/2023

Print Date: 10/07/2023

## SAFETY DATA SHEET

Version 6.8  
Revision Date 10/19/2022  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Barium chloride

Product Number : 202738  
Brand : Aldrich  
Index-No. : 056-004-00-8  
CAS-No. : 10361-37-2

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

Company : Sigma-Aldrich Inc.  
3050 SPRUCE ST  
ST. LOUIS MO 63103  
UNITED STATES

Telephone : +1 314 771-5765  
Fax : +1 800 325-5052

**1.4 Emergency telephone**

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  
Eye irritation (Category 2A), H319

For the full text of the H-Statements mentioned in this Section, see Section 16.

**2.2 GHS Label elements, including precautionary statements**

Pictogram



Signal Word

Danger



|                            |                                                                                                                                  |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Hazard statement(s)        |                                                                                                                                  |
| H301                       | Toxic if swallowed.                                                                                                              |
| H319                       | Causes serious eye irritation.                                                                                                   |
| H332                       | Harmful if inhaled.                                                                                                              |
| Precautionary statement(s) |                                                                                                                                  |
| P261                       | Avoid breathing dust.                                                                                                            |
| P264                       | Wash skin thoroughly after handling.                                                                                             |
| P270                       | Do not eat, drink or smoke when using this product.                                                                              |
| P271                       | Use only outdoors or in a well-ventilated area.                                                                                  |
| P280                       | Wear eye protection/ face protection.                                                                                            |
| P301 + P310 + P330         | IF SWALLOWED: Immediately call a POISON CENTER/ doctor.<br>Rinse mouth.                                                          |
| P304 + P340 + P312         | IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.      |
| P305 + P351 + P338         | IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. |
| P337 + P313                | If eye irritation persists: Get medical advice/ attention.                                                                       |
| 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          | : BaCl <sub>2</sub> |
| Molecular weight | : 208.23 g/mol      |
| CAS-No.          | : 10361-37-2        |
| EC-No.           | : 233-788-1         |
| Index-No.        | : 056-004-00-8      |

| Component              | Classification                                              | Concentration |
|------------------------|-------------------------------------------------------------|---------------|
| <b>barium chloride</b> |                                                             |               |
|                        | Acute Tox. 3; Acute Tox. 4; Eye Irrit. 2A; H301, H332, H319 | <= 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. If breathing stops: mouth-to-mouth breathing or artificial respiration. Oxygen if necessary. Immediately call in physician.

**In case of skin contact**

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

**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**

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

**Unsuitable extinguishing media**

For this substance/mixture no limitations of extinguishing agents are given.

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

Hydrogen chloride gas  
Barium oxide  
Not combustible.  
Ambient fire may liberate hazardous vapours.

**5.3 Advice for firefighters**

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

**5.4 Further information**

Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

---

**SECTION 6: Accidental release measures****6.1 Personal precautions, protective equipment and emergency procedures**

Advice for non-emergency personnel: 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

Change contaminated clothing. Preventive skin protection recommended. Wash hands 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.

Hygroscopic.

#### Storage class

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

| Component       | CAS-No.    | Value                                  | Control parameters    | Basis                                                                            |
|-----------------|------------|----------------------------------------|-----------------------|----------------------------------------------------------------------------------|
| barium chloride | 10361-37-2 | TWA                                    | 0.5 mg/m <sup>3</sup> | USA. NIOSH Recommended Exposure Limits                                           |
|                 |            | TWA                                    | 0.5 mg/m <sup>3</sup> | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
|                 |            | TWA                                    | 0.5 mg/m <sup>3</sup> | USA. ACGIH Threshold Limit Values (TLV)                                          |
|                 | Remarks    | Not classifiable as a human carcinogen |                       |                                                                                  |

|  |  |     |                       |                                                                                         |
|--|--|-----|-----------------------|-----------------------------------------------------------------------------------------|
|  |  | PEL | 0.5 mg/m <sup>3</sup> | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|--|--|-----|-----------------------|-----------------------------------------------------------------------------------------|

## 8.2 Exposure controls

### Appropriate engineering controls

Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.

### Personal protective equipment

#### Eye/face protection

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

#### 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: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: KCL 741 Dermatrill® L

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: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: KCL 741 Dermatrill® 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: powder

|                                                 |                                              |
|-------------------------------------------------|----------------------------------------------|
|                                                 | Color: white                                 |
| b) Odor                                         | odorless                                     |
| c) Odor Threshold                               | Not applicable                               |
| d) pH                                           | 0.8 at 510.4 g/l at 37 °C (99 °F)            |
| e) Melting point/freezing point                 | Melting point/range: 963 °C (1765 °F) - lit. |
| f) Initial boiling point and boiling range      | 1,560 °C 2,840 °F at 1,013 hPa               |
| g) Flash point                                  | ( )Not applicable                            |
| h) Evaporation rate                             | No data available                            |
| i) Flammability (solid, gas)                    | The product is not flammable.                |
| j) Upper/lower flammability or explosive limits | No data available                            |
| k) Vapor pressure                               | No data available                            |
| l) Vapor density                                | No data available                            |
| m) Density                                      | 3.856 g/mL at 25 °C (77 °F) - lit.           |
| Relative density                                | No data available                            |
| n) Water solubility                             | 375 g/l at 20 °C (68 °F)                     |
| o) Partition coefficient: n-octanol/water       | Not applicable for inorganic substances      |
| 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                                         |

## 9.2 Other safety information

No data available

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

### 10.3 Possibility of hazardous reactions

Risk of explosion with:  
furan-2-percarbonic acid

Violent reactions possible with:  
halogen-halogen compounds  
Strong oxidizing agents  
strong reducing agents  
acids

#### **10.4 Conditions to avoid**

no information available

#### **10.5 Incompatible materials**

No data available

#### **10.6 Hazardous decomposition products**

In the event of fire: see section 5

---

### **SECTION 11: Toxicological information**

#### **11.1 Information on toxicological effects**

##### **Acute toxicity**

LD50 Oral - Rat - 118 mg/kg

Remarks: (RTECS)

Inhalation: No data available

Dermal: No data available

No data available

##### **Skin corrosion/irritation**

Skin - reconstructed human epidermis (RhE)

Result: No skin irritation - 15 min

Remarks: (ECHA)

##### **Serious eye damage/eye irritation**

Eyes - Rabbit

Result: irritating

(OECD Test Guideline 405)

##### **Respiratory or skin sensitization**

Local lymph node assay (LLNA) - Mouse

Result: negative

(OECD Test Guideline 429)

##### **Germ cell mutagenicity**

Test Type: Ames test

Test system: Salmonella typhimurium

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 471

Result: negative

Test Type: Mutagenicity (mammal cell test): chromosome aberration.

Test system: Chinese hamster ovary cells

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 473

Result: negative

Test Type: In vitro mammalian cell gene mutation test

Test system: Mouse lymphoma test

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 476

Result: negative

#### **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

#### **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: CQ8750000

Vomiting, Diarrhea

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

The following applies to soluble barium compounds in general: after swallowing: mucosal irritation, nausea, salivation, vomiting, dizziness, pain, colics, and diarrhoea. Systemic effects include: cardiac dysrhythmias, bradycardia (subdued cardiac activity), rise in blood pressure, shock and circulatory collapse as well as muscular rigidity.

Chronic intoxication:

damage of respiratory tract

conjunctivitis

Dermatitis

cardiovascular disorders

Other dangerous properties can not be excluded.

Handle in accordance with good industrial hygiene and safety practice.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

---

## **SECTION 12: Ecological information**

### **12.1 Toxicity**

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|                                                     |                                                                                                                 |
|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| Toxicity to fish                                    | static test LC50 - Danio rerio (zebra fish) - > 174 mg/l - 96 h<br>(OECD Test Guideline 203)                    |
| Toxicity to daphnia and other aquatic invertebrates | static test LC50 - Daphnia magna (Water flea) - 14.5 mg/l - 48 h<br>Remarks: (ECHA)<br>(referred to the cation) |
| Toxicity to algae                                   | static test ErC50 - Pseudokirchneriella subcapitata (algae) - > 100 mg/l - 72 h<br>(OECD Test Guideline 201)    |
| Toxicity to bacteria                                | static test EC50 - activated sludge - > 943.1 mg/l - 3 h<br>(OECD Test Guideline 209)                           |
| Toxicity to fish(Chronic toxicity)                  | semi-static test NOEC - Danio rerio (zebra fish) - >= 1.26 mg/l - 33 d<br>(OECD Test Guideline 210)             |

## 12.2 Persistence and degradability

The methods for determining the biological degradability are not applicable to inorganic substances.

## 12.3 Bioaccumulative potential

Bioaccumulation Lepomis macrochirus - 0.065 mg/l (barium chloride)

Bioconcentration factor (BCF): 22.8

## 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 Endocrine disrupting properties

No data available

## 12.7 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.

---

## SECTION 14: Transport information

### DOT (US)

UN number: 1564 Class: 6.1

Packing group: III

Proper shipping name: Barium compounds, n.o.s. (barium chloride)

Reportable Quantity (RQ):

Poison Inhalation Hazard: No



**IMDG**

UN number: 1564

Class: 6.1

Packing group: III

EMS-

No: F-A, S-A

Proper shipping name: BARIUM COMPOUND, N.O.S. (barium chloride)

**IATA**

UN number: 1564 Class: 6.1

Packing group: III

Proper shipping name: Barium compound, n.o.s. (barium chloride)

---

**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 |
|-----------------|------------|---------------|
| barium chloride | 10361-37-2 | 2015-07-08    |

**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**

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: 6.8

Revision Date: 10/19/2022

Print Date: 10/07/2023

## SAFETY DATA SHEET

Version 6.10  
Revision Date 05/24/2023  
Print Date 08/12/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Benzene

Product Number : 319953  
Brand : SIGALD  
Index-No. : 601-020-00-8  
CAS-No. : 71-43-2

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

Company : Sigma-Aldrich Inc.  
3050 SPRUCE ST  
ST. LOUIS MO 63103  
UNITED STATES

Telephone : +1 314 771-5765  
Fax : +1 800 325-5052

**1.4 Emergency telephone**

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 2), H225  
Skin irritation (Category 2), H315  
Eye irritation (Category 2A), H319  
Germ cell mutagenicity (Category 1B), H340  
Carcinogenicity (Category 1A), H350  
Specific target organ toxicity - repeated exposure (Category 1), Blood, H372  
Aspiration hazard (Category 1), H304  
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)

|      |                                                                         |
|------|-------------------------------------------------------------------------|
| H225 | Highly flammable liquid and vapor.                                      |
| H304 | May be fatal if swallowed and enters airways.                           |
| H315 | Causes skin irritation.                                                 |
| H319 | Causes serious eye irritation.                                          |
| H340 | May cause genetic defects.                                              |
| H350 | May cause cancer.                                                       |
| H372 | Causes damage to organs (Blood) through prolonged or repeated exposure. |
| H401 | Toxic to aquatic life.                                                  |
| H412 | Harmful to aquatic life with long lasting effects.                      |

Precautionary statement(s)

|                    |                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------|
| P201               | Obtain special instructions before use.                                                                                          |
| P202               | Do not handle until all safety precautions have been read and understood.                                                        |
| P210               | Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.                                                              |
| P233               | Keep container tightly closed.                                                                                                   |
| P240               | Ground/bond container and receiving equipment.                                                                                   |
| P241               | Use explosion-proof electrical/ ventilating/ lighting/ equipment.                                                                |
| P242               | Use only non-sparking tools.                                                                                                     |
| P243               | Take precautionary measures against static discharge.                                                                            |
| P260               | Do not breathe mist or vapors.                                                                                                   |
| P264               | Wash skin thoroughly after handling.                                                                                             |
| P270               | Do not eat, drink or smoke when using this product.                                                                              |
| P273               | Avoid release to the environment.                                                                                                |
| P280               | Wear protective gloves/ protective clothing/ eye protection/ face protection.                                                    |
| P301 + P310        | IF SWALLOWED: Immediately call a POISON CENTER/ doctor.                                                                          |
| P303 + P361 + P353 | IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.                             |
| P305 + P351 + P338 | IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. |
| P308 + P313        | IF exposed or concerned: Get medical advice/ attention.                                                                          |
| P331               | Do NOT induce vomiting.                                                                                                          |
| P332 + P313        | If skin irritation occurs: Get medical advice/ attention.                                                                        |
| P337 + P313        | If eye irritation persists: Get medical advice/ attention.                                                                       |
| P362               | Take off contaminated clothing and wash before reuse.                                                                            |
| P370 + P378        | In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.                                             |
| P403 + P235        | Store in a well-ventilated place. Keep cool.                                                                                     |
| P405               | Store locked up.                                                                                                                 |
| P501               | Dispose of contents/ container to an approved waste disposal plant.                                                              |

## 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

### SECTION 3: Composition/information on ingredients

#### 3.1 Substances

Formula : C<sub>6</sub>H<sub>6</sub>  
Molecular weight : 78.11 g/mol  
CAS-No. : 71-43-2  
EC-No. : 200-753-7  
Index-No. : 601-020-00-8

| Component      | Classification                                                                                                                                                                                     | Concentration |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>benzene</b> |                                                                                                                                                                                                    |               |
|                | Flam. Liq. 2; Skin Irrit. 2;<br>Eye Irrit. 2A; Muta. 1B;<br>Carc. 1A; STOT RE 1; Asp.<br>Tox. 1; Aquatic Acute 2;<br>Aquatic Chronic 3; H225,<br>H315, H319, H340, H350,<br>H372, H304, H401, H412 | <= 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

After swallowing: caution if victim vomits. Risk of aspiration! Keep airways free. Pulmonary failure possible after aspiration of vomit. Call a physician immediately.

#### 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**

Carbon dioxide (CO<sub>2</sub>) Foam 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

Flash back possible over considerable distance., Container explosion may occur under fire conditions.

Combustible.

Pay attention to flashback.

Vapors are heavier than air and may spread along floors.

Development of hazardous combustion gases or vapours possible in the event of fire.

Forms explosive mixtures with air at ambient temperatures.

### 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. Risk of explosion.

### 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 safe handling**

Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

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**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**

Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition. Keep locked up or in an area accessible only to qualified or authorized persons.

**Storage class**

Storage class (TRGS 510): 3: Flammable liquids

**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                                                |
|-----------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------------------------------------------------|
| benzene   | 71-43-2 | TWA                                                                                                                                                                 | 0.5 ppm            | USA. ACGIH Threshold Limit Values (TLV)              |
|           | Remarks | Leukemia<br>Substances for which there is a Biological Exposure Index or Indices (see BEI® section)<br>Confirmed human carcinogen<br>Danger of cutaneous absorption |                    |                                                      |
|           |         | STEL                                                                                                                                                                | 2.5 ppm            | USA. ACGIH Threshold Limit Values (TLV)              |
|           |         | Leukemia<br>Substances for which there is a Biological Exposure Index or Indices (see BEI® section)<br>Confirmed human carcinogen<br>Danger of cutaneous absorption |                    |                                                      |
|           |         | TWA                                                                                                                                                                 | 10 ppm             | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
|           |         | Z37.40-1969                                                                                                                                                         |                    |                                                      |
|           |         | CEIL                                                                                                                                                                | 25 ppm             | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
|           |         | Z37.40-1969                                                                                                                                                         |                    |                                                      |
|           |         | Peak                                                                                                                                                                | 50 ppm             | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
|           |         | Z37.40-1969                                                                                                                                                         |                    |                                                      |
|           |         | See 1910.1028. See Table Z-2 for the limits applicable in                                                                                                           |                    |                                                      |

|  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |                                        |
|--|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----------------------------------------|
|  |  | the operations or sectors excluded in 1910.1028<br>The final benzene standard in 1910.1028 applies to all occupational exposures to benzene except some subsegments of industry where exposures are consistently under the action level (i.e., distribution and sale of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures); for the excepted subsegments, the benzene limits in Table Z-2 apply. |         |                                        |
|  |  | TWA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0.1 ppm | USA. NIOSH Recommended Exposure Limits |
|  |  | Potential Occupational Carcinogen<br>See Appendix A                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |         |                                        |
|  |  | ST                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1 ppm   | USA. NIOSH Recommended Exposure Limits |
|  |  | Potential Occupational Carcinogen<br>See Appendix A                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |         |                                        |

## 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: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the 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.

**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. Risk of explosion.

---

**SECTION 9: Physical and chemical properties****9.1 Information on basic physical and chemical properties**

|                                                 |                                                                           |
|-------------------------------------------------|---------------------------------------------------------------------------|
| a) Appearance                                   | Form: liquid<br>Color: clear, 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: 5.5 °C (41.9 °F) - lit.                              |
| f) Initial boiling point and boiling range      | 80 °C 176 °F - lit.                                                       |
| g) Flash point                                  | -11 °C (12 °F) - DIN 51755 Part 1                                         |
| h) Evaporation rate                             | No data available                                                         |
| i) Flammability (solid, gas)                    | No data available                                                         |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 8.0 %(V)<br>Lower explosion limit: 1.2 %(V)        |
| k) Vapor pressure                               | 100 hPa at 20 °C (68 °F)                                                  |
| l) Vapor density                                | No data available                                                         |
| m) Density                                      | 0.874 g/cm <sup>3</sup> at 25 °C (77 °F) - lit.                           |
| Relative density                                | No data available                                                         |
| n) Water solubility                             | ca.1.88 g/l at 23.5 °C (74.3 °F) - soluble                                |
| o) Partition coefficient: n-octanol/water       | log Pow: 2.13 at 25 °C (77 °F) - Bioaccumulation is not expected., (ECHA) |
| p) Autoignition temperature                     | 498 °C (928 °F) at 1,013.5 hPa                                            |
| q) Decomposition temperature                    | No data available                                                         |
| r) Viscosity                                    | 0.604 mm <sup>2</sup> /s at 25 °C (77 °F) -                               |



s) Explosive properties No data available

t) Oxidizing properties none

## **9.2 Other safety information**

No data available

---

## **SECTION 10: Stability and reactivity**

### **10.1 Reactivity**

Vapors may form explosive mixture with air.

### **10.2 Chemical stability**

The product is chemically stable under standard ambient conditions (room temperature) .

### **10.3 Possibility of hazardous reactions**

Exothermic reaction with:

halogens

Halogenated hydrocarbon

in the presence of:

Light metals

Risk of explosion with:

halogen-halogen compounds

Nitric acid

Boranes

Ozone

peroxi compounds

perchlorates

permanganic acid

perchloryl fluoride

Strong oxidizing agents

Chlorine

fluorides

uranium hexafluoride

Oxygen

liquid

Risk of ignition or formation of inflammable gases or vapours with:

chromium(VI) oxide

Fluorine

nitryl compounds

Oxygen

oxyhalogenic compounds

Violent reactions possible with:

mineral acids

sulfur

### **10.4 Conditions to avoid**

Warming.

### **10.5 Incompatible materials**

rubber, various plastics

## 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 - > 2,000 mg/kg

(OECD Test Guideline 401)

Symptoms: Nausea

LC50 Inhalation - Rat - female - 4 h - 43.7 mg/l - vapor

(OECD Test Guideline 403)

LD50 Dermal - Rabbit - male and female - > 8,260 mg/kg

(OECD Test Guideline 402)

No data available

#### Skin corrosion/irritation

Skin - Rabbit

Result: Irritating to skin. - 4 h

(OECD Test Guideline 404)

Remarks: Drying-out effect resulting in rough and chapped skin.

#### Serious eye damage/eye irritation

Eyes - Rabbit

Result: Eye irritation

Remarks: (ECHA)

#### Respiratory or skin sensitization

Maximization Test - Guinea pig

Result: negative

(OECD Test Guideline 406)

#### Germ cell mutagenicity

May cause genetic defects.

Test Type: Ames test

Test system: Salmonella typhimurium

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 471

Result: negative

Test Type: Mutagenicity (mammal cell test): chromosome aberration.

Test system: Chinese hamster lung cells

Metabolic activation: with and without metabolic activation

Method: US-EPA

Result: positive

Test Type: In vitro mammalian cell gene mutation test

Metabolic activation: with and without metabolic activation

Method: US-EPA

Result: positive

Test Type: Mutagenicity (mammal cell test): micronucleus.

Species: Mouse

Cell type: Bone marrow

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Application Route: inhalation (vapor)  
Method: OECD Test Guideline 474  
Result: positive

**Carcinogenicity**

May cause cancer. Positive evidence from human epidemiological studies.

IARC: 1 - Group 1: Carcinogenic to humans (benzene)

NTP: Known - Known to be human carcinogen (benzene)

OSHA: OSHA specifically regulated carcinogen (benzene)

**Reproductive toxicity**

No data available

**Specific target organ toxicity - single exposure**

No data available

**Specific target organ toxicity - repeated exposure**

Causes damage to organs through prolonged or repeated exposure.

- Blood

**Aspiration hazard**

May be fatal if swallowed and enters airways.

**11.2 Additional Information**

Repeated dose toxicity - Rat - male and female - Oral - 120 d - NOAEL (No observed adverse effect level) - 100 mg/kg - LOAEL (Lowest observed adverse effect level) - 25 mg/kg

Remarks: Subchronic toxicity

RTECS: CY1400000

Nausea, Dizziness, Headache, narcosis, Inhalation of high concentrations of benzene may have an initial stimulatory effect on the central nervous system characterized by exhilaration, nervous excitation and/or giddiness, depression, drowsiness, or fatigue. The victim may experience tightness in the chest, breathlessness, and loss of consciousness. Tremors, convulsions, and death due to respiratory paralysis or circulatory collapse can occur in a few minutes to several hours following severe exposures. Aspiration of small amounts of liquid immediately causes pulmonary edema and hemorrhage of pulmonary tissue. Direct skin contact may cause erythema. Repeated or prolonged skin contact may result in drying, scaling dermatitis, or development of secondary skin infections. The chief target organ is the hematopoietic system. Bleeding from the nose, gums, or mucous membranes and the development of purpuric spots, pancytopenia, leukopenia, thrombocytopenia, aplastic anemia, and leukemia may occur as the condition progresses. The bone marrow may appear normal, aplastic or hyperplastic, and may not correlate with peripheral blood-forming tissues. The onset of effects of prolonged benzene exposure may be delayed for many months or years after the actual exposure has ceased., Blood disorders

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

Systemic effects:

After absorption:

agitation

Headache  
Dizziness  
inebriation  
Tiredness  
CNS disorders  
narcosis  
respiratory arrest

Subacute toxicity

After a latency period:

Changes in the blood count  
haemolysis

Other dangerous properties can not be excluded.

This substance should be handled with particular care.

Stomach - Irregularities - Based on Human Evidence

---

## SECTION 12: Ecological information

### 12.1 Toxicity

|                                                     |                                                                                                                         |
|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Toxicity to fish                                    | flow-through test LC50 - <i>Oncorhynchus mykiss</i> (rainbow trout) - 5.3 mg/l - 96 h<br>(OECD Test Guideline 203)      |
| Toxicity to daphnia and other aquatic invertebrates | static test EC50 - <i>Daphnia magna</i> (Water flea) - 10 mg/l - 48 h<br>(OECD Test Guideline 202)                      |
| Toxicity to algae                                   | static test ErC50 - <i>Pseudokirchneriella subcapitata</i> (green algae) - 100 mg/l - 72 h<br>(OECD Test Guideline 201) |
| Toxicity to bacteria                                | static test IC50 - - 13 mg/l - 24 h<br>Remarks: (ECHA)                                                                  |

### 12.2 Persistence and degradability

|                  |                                                                                                     |
|------------------|-----------------------------------------------------------------------------------------------------|
| Biodegradability | aerobic - Exposure time 28 d<br>Result: 96 % - Readily biodegradable.<br>(OECD Test Guideline 301F) |
|------------------|-----------------------------------------------------------------------------------------------------|

### 12.3 Bioaccumulative potential

|                 |                                                                                                            |
|-----------------|------------------------------------------------------------------------------------------------------------|
| Bioaccumulation | <i>Leuciscus idus</i> (Golden orfe) - 3 d<br>- 0.05 mg/l(benzene)<br><br>Bioconcentration factor (BCF): 10 |
|-----------------|------------------------------------------------------------------------------------------------------------|

#### 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 Endocrine disrupting properties

No data available

#### 12.7 Other adverse effects

Endangers drinking-water supplies if allowed to enter soil or water.

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.

---

### SECTION 14: Transport information

#### DOT (US)

UN number: 1114    Class: 3    Packing group: II  
Proper shipping name: Benzene  
Reportable Quantity (RQ): 10 lbs  
Reportable Quantity (RQ): 10 lbs  
Poison Inhalation Hazard: No

#### IMDG

UN number: 1114    Class: 3    Packing group: II    EMS-No: F-E, S-D  
Proper shipping name: BENZENE

#### IATA

UN number: 1114    Class: 3    Packing group: II  
Proper shipping name: Benzene

---

### 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 |
|---------|---------------|
|---------|---------------|

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**SARA 311/312 Hazards**

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

**Reportable Quantity** : D018 lbs**Massachusetts Right To Know Components**

benzene

CAS-No.  
71-43-2Revision Date  
2007-07-01**Pennsylvania Right To Know Components**

benzene

CAS-No.  
71-43-2Revision Date  
2007-07-01**California Prop. 65 Components**

, which is/are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov/benzene](http://www.P65Warnings.ca.gov/benzene)

CAS-No.  
71-43-2Revision Date  
2009-02-01

---

**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: 6.10

Revision Date: 05/24/2023

Print Date: 08/12/2023

## SAFETY DATA SHEET

Version 6.8  
Revision Date 07/28/2022  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Beryllium

Product Number : 265063

Brand : Aldrich

Index-No. : 004-001-00-7

CAS-No. : 7440-41-7

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

Company : Sigma-Aldrich 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

Skin irritation (Category 2), H315

Eye irritation (Category 2A), H319

Skin sensitization (Category 1), H317

Carcinogenicity (Category 1B), H350

Specific target organ toxicity - repeated exposure (Category 1), H372

For the full text of the H-Statements mentioned in this Section, see Section 16.

**2.2 GHS Label elements, including precautionary statements**

Pictogram



|                            |                                                                                                                                  |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Signal Word                | Danger                                                                                                                           |
| Hazard statement(s)        |                                                                                                                                  |
| H301                       | Toxic if swallowed.                                                                                                              |
| H315                       | Causes skin irritation.                                                                                                          |
| H317                       | May cause an allergic skin reaction.                                                                                             |
| H319                       | Causes serious eye irritation.                                                                                                   |
| H350                       | May cause cancer.                                                                                                                |
| H372                       | Causes damage to organs through prolonged or repeated exposure.                                                                  |
| Precautionary statement(s) |                                                                                                                                  |
| P201                       | Obtain special instructions before use.                                                                                          |
| P202                       | Do not handle until all safety precautions have been read and understood.                                                        |
| P260                       | Do not breathe dust.                                                                                                             |
| P264                       | Wash skin thoroughly after handling.                                                                                             |
| P270                       | Do not eat, drink or smoke when using this product.                                                                              |
| P272                       | Contaminated work clothing must not be allowed out of the workplace.                                                             |
| 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                | IF ON SKIN: Wash with plenty of soap and water.                                                                                  |
| P305 + P351 + P338         | IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. |
| P308 + P313                | IF exposed or concerned: Get medical advice/ attention.                                                                          |
| P333 + P313                | If skin irritation or rash occurs: Get medical advice/ attention.                                                                |
| P337 + P313                | If eye irritation persists: Get medical advice/ attention.                                                                       |
| P362                       | Take off contaminated clothing and wash before reuse.                                                                            |
| 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          | : Be           |
| Molecular weight | : 9.01 g/mol   |
| CAS-No.          | : 7440-41-7    |
| EC-No.           | : 231-150-7    |
| Index-No.        | : 004-001-00-7 |

| Component             | Classification                                                                                                    | Concentration |
|-----------------------|-------------------------------------------------------------------------------------------------------------------|---------------|
| <b>Beryllium foil</b> |                                                                                                                   |               |
|                       | Acute Tox. 3; Skin Irrit. 2; Eye Irrit. 2A; Skin Sens. 1; Carc. 1B; STOT RE 1; H301, H315, H319, H317, H350, H372 | <= 100 %      |



---

## **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**

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

#### **Unsuitable extinguishing media**

For this substance/mixture no limitations of extinguishing agents are given.

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

Beryllium oxides

Not combustible.

Ambient fire may liberate hazardous vapours.

### **5.3 Advice for firefighters**

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

### **5.4 Further information**

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): 6.1D: 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**

| Component      | CAS-No.   | Value                                  | Control parameters          | Basis                                                                                   |
|----------------|-----------|----------------------------------------|-----------------------------|-----------------------------------------------------------------------------------------|
| Beryllium foil | 7440-41-7 | TWA                                    | 0.0002 mg/m <sup>3</sup>    | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|                |           | STEL                                   | 0.002 mg/m <sup>3</sup>     | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|                |           | TWA                                    | 2microgram per cubic meter  | USA. Occupational Exposure Limits (OSHA) - Table Z-2                                    |
|                |           | CEIL                                   | 5microgram per cubic meter  | USA. Occupational Exposure Limits (OSHA) - Table Z-2                                    |
|                |           | Peak                                   | 25microgram per cubic meter | USA. Occupational Exposure Limits (OSHA) - Table Z-2                                    |
|                |           | PEL                                    | 0.0002 mg/m <sup>3</sup>    | OSHA Specifically Regulated Chemicals/Carcinogens                                       |
|                | Remarks   | OSHA specifically regulated carcinogen |                             |                                                                                         |
|                |           | STEL                                   | 0.002 mg/m <sup>3</sup>     | OSHA Specifically Regulated Chemicals/Carcinogens                                       |
|                |           | OSHA specifically regulated carcinogen |                             |                                                                                         |
|                |           | Potential Occupational Carcinogen      |                             |                                                                                         |
|                |           | PEL                                    | 0.0002 mg/m <sup>3</sup>    | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|                |           | STEL                                   | 0.002 mg/m <sup>3</sup>     | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|                |           | C                                      | 0.025 mg/m <sup>3</sup>     | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |

## 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: 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**

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: Chunks                                    |
| b) Odor                                         | No data available                               |
| c) Odor Threshold                               | No data available                               |
| d) pH                                           | No data available                               |
| e) Melting point/freezing point                 | Melting point/range: 1,278 °C (2,332 °F) - lit. |
| f) Initial boiling point and boiling range      | 2,970 °C 5,378 °F - lit.                        |
| g) Flash point                                  | ( )Not applicable                               |
| h) Evaporation rate                             | No data available                               |
| i) Flammability (solid, gas)                    | The product is not flammable.                   |
| j) Upper/lower flammability or explosive limits | No data available                               |
| k) Vapor pressure                               | No data available                               |

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|                                              |                                                |
|----------------------------------------------|------------------------------------------------|
| l) Vapor density                             | No data available                              |
| m) Density                                   | 1.85 g/cm <sup>3</sup> at 25 °C (77 °F) - lit. |
| Relative density                             | No data available                              |
| n) Water solubility                          | No data available                              |
| o) Partition coefficient:<br>n-octanol/water | Not applicable for inorganic substances        |
| 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                      | none                                           |

## 9.2 Other safety information

No data available

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to avoid

no information available

### 10.5 Incompatible materials

Strong oxidizing agents

### 10.6 Hazardous decomposition products

In the event of fire: see section 5

---

## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

#### Acute toxicity

Oral: No data available

Inhalation: No data available

Dermal: No data available

#### Skin corrosion/irritation

No data available

#### Serious eye damage/eye irritation

No data available

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**Respiratory or skin sensitization**

No data available

**Germ cell mutagenicity**

No data available

**Carcinogenicity**

Possible human carcinogen

IARC: 1 - Group 1: Carcinogenic to humans (Beryllium foil)

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**

Causes damage to organs through prolonged or repeated exposure. **Aspiration hazard**

No data available

**11.2 Additional Information**

RTECS: DS1750000

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

---

**SECTION 12: Ecological information****12.1 Toxicity**

No data available

**12.2 Persistence and degradability**

Not applicable for inorganic substances

**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 Endocrine disrupting properties**

No data available

**12.7 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.

---

## SECTION 14: Transport information

#### DOT (US)

UN number: 3288    Class: 6.1    Packing group: III  
Proper shipping name: Toxic solid, inorganic, n.o.s. (Beryllium foil)  
Reportable Quantity (RQ): 10 lbs  
Poison Inhalation Hazard: No

#### IMDG

UN number: 3288    Class: 6.1    Packing group: III    EMS-No: F-A, S-A  
Proper shipping name: TOXIC SOLID, INORGANIC, N.O.S. (Beryllium foil)

#### IATA

UN number: 3288    Class: 6.1    Packing group: III  
Proper shipping name: Toxic solid, inorganic, n.o.s. (Beryllium foil)

---

## 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:

|                |                      |                             |
|----------------|----------------------|-----------------------------|
| Beryllium foil | CAS-No.<br>7440-41-7 | Revision Date<br>1989-08-11 |
|----------------|----------------------|-----------------------------|

#### 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

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

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Version: 6.8

Revision Date: 07/28/2022

Print Date: 10/07/2023



## SAFETY DATA SHEET

Version 6.12  
Revision Date 05/24/2023  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : BTEX-Standard

Product Number : 43728  
Brand : Sigma-Aldrich

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

Company : Sigma-Aldrich 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)**

Germ cell mutagenicity (Category 1B), H340  
Carcinogenicity (Category 1A), H350  
Reproductive toxicity (Category 2), H361

For the full text of the H-Statements mentioned in this Section, see Section 16.

**2.2 GHS Label elements, including precautionary statements**

Pictogram



Signal Word : Danger

Hazard statement(s)  
H340 : May cause genetic defects.

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|                            |                                                                               |
|----------------------------|-------------------------------------------------------------------------------|
| H350                       | May cause cancer.                                                             |
| H361                       | Suspected of damaging fertility or the unborn child.                          |
| Precautionary statement(s) |                                                                               |
| P201                       | Obtain special instructions before use.                                       |
| P202                       | Do not handle until all safety precautions have been read and understood.     |
| P280                       | Wear protective gloves/ protective clothing/ eye protection/ face protection. |
| P308 + P313                | IF exposed or concerned: Get medical advice/ attention.                       |
| P405                       | Store locked up.                                                              |
| P501                       | Dispose of contents/ container to an approved waste disposal plant.           |

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## SECTION 3: Composition/information on ingredients

### 3.2 Mixtures

| Component                  |                       | Classification                                                                                                                                                                                                 | Concentration    |
|----------------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| <b>dimethyl sulphoxide</b> |                       |                                                                                                                                                                                                                |                  |
| CAS-No.                    | 67-68-5               | Flam. Liq. 4; H227                                                                                                                                                                                             | >= 90 - <= 100 % |
| EC-No.                     | 200-664-3             |                                                                                                                                                                                                                |                  |
| Registration number        | 01-2119431362-50-XXXX |                                                                                                                                                                                                                |                  |
|                            |                       |                                                                                                                                                                                                                |                  |
| <b>Toluene</b>             |                       |                                                                                                                                                                                                                |                  |
| CAS-No.                    | 108-88-3              | Flam. Liq. 2; Skin Irrit. 2; Repr. 2; STOT SE 3; STOT RE 2; Asp. Tox. 1; Aquatic Acute 2; Aquatic Chronic 3; H225, H315, H361, H336, H373, H304, H401, H412<br>Concentration limits:<br>20 %: STOT SE 3, H336; | >= 0.1 - < 1 %   |
| EC-No.                     | 203-625-9             |                                                                                                                                                                                                                |                  |
| Index-No.                  | 601-021-00-3          |                                                                                                                                                                                                                |                  |
| Registration number        | 01-2119471310-51-XXXX |                                                                                                                                                                                                                |                  |
| <b>benzene</b>             |                       |                                                                                                                                                                                                                |                  |
| CAS-No.                    | 71-43-2               | Flam. Liq. 2; Skin Irrit. 2; Eye Irrit. 2A; Muta. 1B; Carc. 1A; STOT RE 1; Asp. Tox. 1; Aquatic Acute 2; Aquatic Chronic 3; H225, H315, H319, H340, H350, H372, H304, H401, H412                               | >= 0.1 - < 1 %   |
| EC-No.                     | 200-753-7             |                                                                                                                                                                                                                |                  |
| Index-No.                  | 601-020-00-8          |                                                                                                                                                                                                                |                  |
| Registration number        | 01-2119447106-44-XXXX |                                                                                                                                                                                                                |                  |
| <b>ethylbenzene</b>        |                       |                                                                                                                                                                                                                |                  |
| CAS-No.                    | 100-41-4              | Flam. Liq. 2; Acute Tox. 4; Carc. 2; STOT RE 2; Asp. Tox. 1; Aquatic Acute 2; Aquatic Chronic 3; H225.                                                                                                         | >= 0.1 - < 1 %   |
| EC-No.                     | 202-849-4             |                                                                                                                                                                                                                |                  |
| Index-No.                  | 601-023-00-4          |                                                                                                                                                                                                                |                  |
| Registration               | 01-2119489370-35-     |                                                                                                                                                                                                                |                  |

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|        |      |                                    |  |
|--------|------|------------------------------------|--|
| number | XXXX | H332, H351, H373, H304, 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**

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**

After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

#### **Suitable extinguishing media**

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

Sulfur oxides

Combustible.

Development of hazardous combustion gases or vapours possible in the event of fire.

### 5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

#### 5.4 Further information

Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

---

### SECTION 6: Accidental release measures

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

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.

For personal protection see section 8.

#### 6.2 Environmental precautions

Do not let product enter drains.

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

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

#### 6.4 Reference to other sections

For disposal see section 13.

---

### SECTION 7: Handling and storage

#### 7.1 Precautions for safe handling

##### Advice on safe handling

Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

##### 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 stability

Recommended storage temperature

2 - 8 °C

##### 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                                                              |
|---------------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|--------------------------------------------------------------------|
| dimethyl sulphoxide | 67-68-5  | TWA                                                                                                                                                                                                              | 250 ppm              | USA. Workplace Environmental Exposure Levels (WEEL)                |
| Toluene             | 108-88-3 | TWA                                                                                                                                                                                                              | 100 ppm<br>375 mg/m3 | USA. Table Z-1-A Limits for Air Contaminants (1989 vacated values) |
|                     |          | STEL                                                                                                                                                                                                             | 150 ppm<br>560 mg/m3 | USA. Table Z-1-A Limits for Air Contaminants (1989 vacated values) |
|                     |          | TWA                                                                                                                                                                                                              | 200 ppm              | USA. Occupational Exposure Limits (OSHA) - Table Z-2               |
|                     | Remarks  | Z37.12-1967                                                                                                                                                                                                      |                      |                                                                    |
|                     |          | CEIL                                                                                                                                                                                                             | 300 ppm              | USA. Occupational Exposure Limits (OSHA) - Table Z-2               |
|                     |          | Z37.12-1967                                                                                                                                                                                                      |                      |                                                                    |
|                     |          | Peak                                                                                                                                                                                                             | 500 ppm              | USA. Occupational Exposure Limits (OSHA) - Table Z-2               |
|                     |          | Z37.12-1967                                                                                                                                                                                                      |                      |                                                                    |
|                     |          | TWA                                                                                                                                                                                                              | 20 ppm               | USA. ACGIH Threshold Limit Values (TLV)                            |
|                     |          | Visual impairment<br>Female reproductive<br>Pregnancy loss<br>2022 Adoption<br>Substances for which there is a Biological Exposure Index or Indices (see BEI® section)<br>Not classifiable as a human carcinogen |                      |                                                                    |
|                     |          | TWA                                                                                                                                                                                                              | 100 ppm<br>375 mg/m3 | USA. NIOSH Recommended Exposure Limits                             |
|                     |          | ST                                                                                                                                                                                                               | 150 ppm<br>560 mg/m3 | USA. NIOSH Recommended Exposure Limits                             |
| benzene             | 71-43-2  | TWA                                                                                                                                                                                                              | 0.5 ppm              | USA. ACGIH Threshold Limit Values (TLV)                            |
|                     |          | Leukemia<br>Substances for which there is a Biological Exposure Index or Indices (see BEI® section)<br>Confirmed human carcinogen<br>Danger of cutaneous absorption                                              |                      |                                                                    |
|                     |          | STEL                                                                                                                                                                                                             | 2.5 ppm              | USA. ACGIH Threshold Limit Values (TLV)                            |
|                     |          | Leukemia<br>Substances for which there is a Biological Exposure Index or Indices (see BEI® section)<br>Confirmed human carcinogen<br>Danger of cutaneous absorption                                              |                      |                                                                    |

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|              |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                      |                                                                                         |
|--------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------------------------------------------------------------------------|
|              |          | TWA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 10 ppm               | USA. Occupational Exposure Limits (OSHA) - Table Z-2                                    |
|              |          | Z37.40-1969                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                      |                                                                                         |
|              |          | CEIL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 25 ppm               | USA. Occupational Exposure Limits (OSHA) - Table Z-2                                    |
|              |          | Z37.40-1969                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                      |                                                                                         |
|              |          | Peak                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 50 ppm               | USA. Occupational Exposure Limits (OSHA) - Table Z-2                                    |
|              |          | Z37.40-1969                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                      |                                                                                         |
|              |          | See 1910.1028. See Table Z-2 for the limits applicable in the operations or sectors excluded in 1910.1028<br>The final benzene standard in 1910.1028 applies to all occupational exposures to benzene except some subsegments of industry where exposures are consistently under the action level (i.e., distribution and sale of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures); for the excepted subsegments, the benzene limits in Table Z-2 apply. |                      |                                                                                         |
|              |          | TWA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 0.1 ppm              | USA. NIOSH Recommended Exposure Limits                                                  |
|              |          | Potential Occupational Carcinogen<br>See Appendix A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                      |                                                                                         |
|              |          | ST                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1 ppm                | USA. NIOSH Recommended Exposure Limits                                                  |
|              |          | Potential Occupational Carcinogen<br>See Appendix A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                      |                                                                                         |
| ethylbenzene | 100-41-4 | TWA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 100 ppm<br>435 mg/m3 | USA. NIOSH Recommended Exposure Limits                                                  |
|              |          | ST                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 125 ppm<br>545 mg/m3 | USA. NIOSH Recommended Exposure Limits                                                  |
|              |          | TWA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 100 ppm<br>435 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1<br>Limits for Air Contaminants     |
|              |          | STEL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 30 ppm<br>130 mg/m3  | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|              |          | PEL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 5 ppm<br>22 mg/m3    | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |

#### Biological occupational exposure limits

| Component | CAS-No.  | Parameters                      | Value     | Biological specimen | Basis                                     |
|-----------|----------|---------------------------------|-----------|---------------------|-------------------------------------------|
| Toluene   | 108-88-3 | Toluene                         | 0.02 mg/l | In blood            | ACGIH - Biological Exposure Indices (BEI) |
|           | Remarks  | Prior to last shift of workweek |           |                     |                                           |

|              |          |                                                          |                    |       |                                           |
|--------------|----------|----------------------------------------------------------|--------------------|-------|-------------------------------------------|
|              |          | Toluene                                                  | 0.03 mg/l          | Urine | ACGIH - Biological Exposure Indices (BEI) |
|              |          | End of shift (As soon as possible after exposure ceases) |                    |       |                                           |
|              |          | o-Cresol                                                 | 0.3mg/g creatinine | Urine | ACGIH - Biological Exposure Indices (BEI) |
|              |          | End of shift (As soon as possible after exposure ceases) |                    |       |                                           |
| ethylbenzene | 100-41-4 | Sum of mandelic acid and phenyl glyoxylic acid           | 0.15g/g creatinine | Urine | ACGIH - Biological Exposure Indices (BEI) |
|              |          | End of shift (As soon as possible after exposure ceases) |                    |       |                                           |

## 8.2 Exposure controls

### Appropriate engineering controls

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

required

#### Body Protection

protective clothing

#### Respiratory protection

required when vapours/aerosols are generated.

Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

#### Control of environmental exposure

Do not let product enter drains.

## SECTION 9: Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

- |                   |                                         |
|-------------------|-----------------------------------------|
| a) Appearance     | Form: clear, liquid<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 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                                      | 0.998 g/cm <sup>3</sup> at 20 °C (68 °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                         | Not classified as explosive.             |
| t) Oxidizing properties                         | none                                     |

## 9.2 Other safety information

No data available

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to avoid

no information available



## 10.5 Incompatible materials

Strong oxidizing agents

## 10.6 Hazardous decomposition products

In the event of fire: see section 5

---

## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

#### Mixture

##### Acute toxicity

Oral: No data available

Inhalation: No data available

Dermal: No data available

##### Skin corrosion/irritation

No data available

##### Serious eye damage/eye irritation

No data available

##### Respiratory or skin sensitization

No data available

##### Germ cell mutagenicity

Possible mutagen

##### Carcinogenicity

Possible human carcinogen

IARC: 1 - Group 1: Carcinogenic to humans (benzene)

IARC: 2B - Group 2B: Possibly carcinogenic to humans (ethylbenzene)

NTP: Known - Known to be human carcinogen (benzene)

OSHA: OSHA specifically regulated carcinogen (benzene)

##### Reproductive toxicity

Suspected of damaging the unborn child.

Suspected of damaging fertility.

##### 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

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

Other dangerous properties can not be excluded.

This substance should be handled with particular care.

Eyes - Eye disease - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

## **Components**

### **dimethyl sulphoxide**

#### **Acute toxicity**

LD50 Oral - Rat - male and female - 28,300 mg/kg

(OECD Test Guideline 401)

LC0 Inhalation - Rat - male and female - 4 h - > 5.33 mg/l - dust/mist

(OECD Test Guideline 403)

LD50 Dermal - Rat - male and female - 40,000 mg/kg

Remarks: (ECHA)

#### **Skin corrosion/irritation**

Skin - Rabbit

Result: slight irritation - 4 h

(OECD Test Guideline 404)

#### **Serious eye damage/eye irritation**

Eyes - Rabbit

Result: slight irritation - 24 h

(OECD Test Guideline 405)

#### **Respiratory or skin sensitization**

Maximization Test - Guinea pig

Result: negative

(OECD Test Guideline 406)

Local lymph node assay (LLNA) - Mouse

Result: negative

(OECD Test Guideline 429)

#### **Germ cell mutagenicity**

Test Type: Ames test

Test system: Salmonella typhimurium

Result: negative

Test Type: sister chromatid exchange assay

Test system: Chinese hamster ovary cells

Result: negative

Test Type: Mutagenicity (mammal cell test): chromosome aberration.

Test system: Chinese hamster ovary cells

Result: negative

Method: OECD Test Guideline 474

Species: Rat - male and female

Result: negative

#### **Carcinogenicity**

No data available

#### **Reproductive toxicity**

No data available

**Specific target organ toxicity - single exposure**

No data available

**Specific target organ toxicity - repeated exposure****Aspiration hazard**

No data available

**Toluene****Acute toxicity**

LD50 Oral - Rat - male - 5,580 mg/kg

(Tested according to Directive 92/69/EEC.)

LC50 Inhalation - Rat - male and female - 4 h - 25.7 mg/l - vapor

(OECD Test Guideline 403)

LD50 Dermal - Rabbit - > 5,000 mg/kg

Remarks: (ECHA)

No data available

**Skin corrosion/irritation**

Skin - Rabbit

Result: irritating - 4 h

Remarks: (ECHA)

**Serious eye damage/eye irritation**

Eyes - Rabbit

Result: slight irritation

(OECD Test Guideline 405)

**Respiratory or skin sensitization**

Maximization Test - Guinea pig

Result: negative

(Regulation (EC) No. 440/2008, Annex, B.6)

**Germ cell mutagenicity**

Test Type: In vitro mammalian cell gene mutation test

Test system: Mouse lymphoma test

Result: negative

Test Type: Ames test

Test system: *S. typhimurium*

Result: negative

Species: Rat - Bone marrow

Result: negative

Remarks: (ECHA)

**Carcinogenicity**

No data available

**Reproductive toxicity**

Suspected of damaging the unborn child.

**Specific target organ toxicity - single exposure**

May cause drowsiness or dizziness. - Central nervous system

**Specific target organ toxicity - repeated exposure**

May cause damage to organs through prolonged or repeated exposure.

- Central nervous system

**Aspiration hazard**

Aspiration hazard, Aspiration may cause pulmonary edema and pneumonitis.

**benzene****Acute toxicity**

LD50 Oral - Rat - male - > 2,000 mg/kg

(OECD Test Guideline 401)

Symptoms: Nausea

LC50 Inhalation - Rat - female - 4 h - 43.7 mg/l - vapor

(OECD Test Guideline 403)

LD50 Dermal - Rabbit - male and female - > 8,260 mg/kg

(OECD Test Guideline 402)

No data available

**Skin corrosion/irritation**

Skin - Rabbit

Result: Irritating to skin. - 4 h

(OECD Test Guideline 404)

Remarks: Drying-out effect resulting in rough and chapped skin.

**Serious eye damage/eye irritation**

Eyes - Rabbit

Result: Eye irritation

Remarks: (ECHA)

**Respiratory or skin sensitization**

Maximization Test - Guinea pig

Result: negative

(OECD Test Guideline 406)

**Germ cell mutagenicity**

May cause genetic defects.

Test Type: Ames test

Test system: Salmonella typhimurium

Result: negative

Test Type: Mutagenicity (mammal cell test): chromosome aberration.

Test system: Chinese hamster lung cells

Result: positive

Test Type: In vitro mammalian cell gene mutation test

Result: positive

Method: OECD Test Guideline 474

Species: Mouse - male - Bone marrow

Result: positive

**Carcinogenicity**

May cause cancer. Positive evidence from human epidemiological studies.

**Reproductive toxicity**

No data available

**Specific target organ toxicity - single exposure**

No data available

Acute oral toxicity - Nausea

**Specific target organ toxicity - repeated exposure**

Causes damage to organs through prolonged or repeated exposure.

- Blood

**Aspiration hazard**

May be fatal if swallowed and enters airways.

**ethylbenzene****Acute toxicity**

LD50 Oral - Rat - male and female - 3,500 mg/kg

Remarks: (ECHA)

LC50 Inhalation - Rat - male - 4 h - 17.8 mg/l - vapor

Remarks: (ECHA)

LD50 Dermal - Rabbit - 15,433 mg/kg

Remarks: (RTECS)

**Skin corrosion/irritation**

Skin - Rabbit

Result: Moderate skin irritation - 24 h

Remarks: (ECHA)

**Serious eye damage/eye irritation**

Eyes - Rabbit

Result: Mild eye irritation

Remarks: (ECHA)

**Respiratory or skin sensitization**

No data available

**Germ cell mutagenicity**

Test Type: Chromosome aberration test in vitro

Test system: Chinese hamster ovary cells

Result: negative

Test Type: In vitro mammalian cell gene mutation test

Test system: mouse lymphoma cells

Result: negative

Method: OECD Test Guideline 474

Species: Mouse - male - Bone marrow

Result: negative

Method: OECD Test Guideline 486

Species: Mouse - male and female

Result: negative

**Carcinogenicity**

No data available

**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.

- hearing organs

Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

**Aspiration hazard**

Aspiration may cause pulmonary edema and pneumonitis.

---

**SECTION 12: Ecological information**

**12.1 Toxicity**

**Mixture**

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 Endocrine disrupting properties**

No data available

**12.7 Other adverse effects**

No data available

**Components**

**dimethyl sulphoxide**

|                                                     |                                                                                                                     |
|-----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Toxicity to fish                                    | static test LC50 - Danio rerio (zebra fish) - > 25,000 mg/l - 96 h<br>(OECD Test Guideline 203)                     |
| Toxicity to daphnia and other aquatic invertebrates | static test EC50 - Daphnia magna (Water flea) - 24,600 mg/l - 48 h<br>(OECD Test Guideline 202)                     |
| Toxicity to algae                                   | static test ErC50 - Pseudokirchneriella subcapitata (green algae) - 17,000 mg/l - 72 h<br>(OECD Test Guideline 201) |
| Toxicity to bacteria                                | EC50 - activated sludge - 10 - 100 mg/l - 30 min<br>(ISO 8192)                                                      |

**Toluene**

|                                       |                                                                                                  |
|---------------------------------------|--------------------------------------------------------------------------------------------------|
| Toxicity to fish                      | flow-through test LC50 - Oncorhynchus kisutch (coho salmon) - 5.5 mg/l - 96 h<br>Remarks: (ECHA) |
| Toxicity to daphnia and other aquatic | EC50 - Ceriodaphnia dubia (water flea) - 3.78 mg/l - 48 h<br>(US-EPA)                            |

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## invertebrates

|                                                                       |                                                                                                   |
|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| Toxicity to bacteria                                                  | static test EC50 - Bacteria - 84 mg/l - 24 h<br>Remarks: (ECHA)                                   |
| Toxicity to fish(Chronic toxicity)                                    | flow-through test NOEC - Oncorhynchus kisutch (coho salmon) - 1.39 mg/l - 40 d<br>Remarks: (ECHA) |
| Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity) | NOEC - Ceriodaphnia dubia (water flea) - 0.74 mg/l - 7 d<br>(US-EPA)                              |

## benzene

|                                                     |                                                                                                                  |
|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| Toxicity to fish                                    | flow-through test LC50 - Oncorhynchus mykiss (rainbow trout) - 5.3 mg/l - 96 h<br>(OECD Test Guideline 203)      |
| Toxicity to daphnia and other aquatic invertebrates | static test EC50 - Daphnia magna (Water flea) - 10 mg/l - 48 h<br>(OECD Test Guideline 202)                      |
| Toxicity to algae                                   | static test ErC50 - Pseudokirchneriella subcapitata (green algae) - 100 mg/l - 72 h<br>(OECD Test Guideline 201) |
| Toxicity to bacteria                                | static test IC50 - - 13 mg/l - 24 h<br>Remarks: (ECHA)                                                           |

## ethylbenzene

|                                                     |                                                                                                            |
|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| Toxicity to fish                                    | semi-static test LC50 - Oncorhynchus mykiss (rainbow trout) - 4.2 mg/l - 96 h<br>(OECD Test Guideline 203) |
| Toxicity to daphnia and other aquatic invertebrates | static test EC50 - Daphnia magna (Water flea) - 1.8 - 2.4 mg/l - 48 h<br>(US-EPA)                          |
| Toxicity to algae                                   | static test EC50 - Pseudokirchneriella subcapitata (green algae) - 3.6 mg/l - 96 h<br>(US-EPA)             |
| Toxicity to bacteria                                | EC50 - Photobacterium phosphoreum - 9.68 mg/l - 30 min<br>Remarks: (IUCLID)                                |

---

## 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.

---

## SECTION 14: Transport information

#### DOT (US)

Not dangerous goods

#### IMDG

Not dangerous goods

#### IATA

Not dangerous goods

#### Further information

Not classified as dangerous in the meaning of transport regulations.

---

## SECTION 15: Regulatory information

#### SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

#### SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

|              | CAS-No.  | Revision Date |
|--------------|----------|---------------|
| benzene      | 71-43-2  | 2007-07-01    |
| ethylbenzene | 100-41-4 | 2007-07-01    |

#### SARA 311/312 Hazards

Chronic Health Hazard

:  
**Reportable Quantity**      D018 lbs  
                                         F003 lbs

#### Massachusetts Right To Know Components

|         | CAS-No. | Revision Date |
|---------|---------|---------------|
| benzene | 71-43-2 | 2007-07-01    |



## Pennsylvania Right To Know Components

|              |                     |                             |
|--------------|---------------------|-----------------------------|
| Toluene      | CAS-No.<br>108-88-3 | Revision Date<br>2007-07-01 |
| benzene      | 71-43-2             | 2007-07-01                  |
| p-xylene     | 106-42-3            | 2007-07-01                  |
| m-xylene     | 108-38-3            | 2007-07-01                  |
| o-xylene     | 95-47-6             | 2007-07-01                  |
| ethylbenzene | 100-41-4            | 2007-07-01                  |

## California Prop. 65 Components

|                                                                                                                                                                                                            |                     |                             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------------------------|
| , which is/are known to the State of California to cause cancer, and benzene                                                                                                                               | CAS-No.<br>71-43-2  | Revision Date<br>2009-02-01 |
| , which is/are known to the State of California to cause birth defects or other reproductive harm. For more information go to <a href="http://www.P65Warnings.ca.gov">www.P65Warnings.ca.gov</a> . Toluene | CAS-No.<br>108-88-3 | Revision Date<br>2009-02-01 |

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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: 6.12

Revision Date: 05/24/2023

Print Date: 10/07/2023

## SAFETY DATA SHEET

Version 6.9  
Revision Date 05/24/2023  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Cadmium

Product Number : 265365  
Brand : Aldrich  
Index-No. : 048-002-00-0  
CAS-No. : 7440-43-9

**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, Inhalation (Category 2), H330  
Germ cell mutagenicity (Category 2), H341  
Carcinogenicity (Category 1B), H350  
Reproductive toxicity (Category 2), H361  
Specific target organ toxicity - repeated exposure (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**

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Pictogram



Signal Word

Danger

Hazard statement(s)

H330 Fatal if inhaled.  
H341 Suspected of causing genetic defects.  
H350 May cause cancer.  
H361 Suspected of damaging fertility or the unborn child.  
H372 Causes 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.  
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.  
P284 Wear respiratory protection.  
P304 + P340 + P310 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor.  
P308 + P313 IF exposed or concerned: Get medical advice/ attention.  
P391 Collect spillage.  
P403 + P233 Store in a well-ventilated place. Keep container tightly closed.  
P405 Store locked up.  
P501 Dispose of contents/ container to an approved waste disposal plant.

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Formula : Cd  
Molecular weight : 112.41 g/mol  
CAS-No. : 7440-43-9  
EC-No. : 231-152-8  
Index-No. : 048-002-00-0

| Component      | Classification                                                                                          | Concentration |
|----------------|---------------------------------------------------------------------------------------------------------|---------------|
| <b>Cadmium</b> | Acute Tox. 2; Muta. 2;<br>Carc. 1B; Repr. 2; STOT<br>RE 1; Aquatic Acute 1;<br>Aquatic Chronic 1; H330, | <= 100 %      |

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|  |                                                                       |  |
|--|-----------------------------------------------------------------------|--|
|  | H341, H350, H361, H372, H400, H410<br>M-Factor - Aquatic Acute: 1,000 |  |
|--|-----------------------------------------------------------------------|--|

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. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

#### In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

#### In case of eye contact

After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

#### If swallowed

After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

#### Suitable extinguishing media

Sand Special powder against metal fire Cement

#### Unsuitable extinguishing media

For this substance/mixture no limitations of extinguishing agents are given.

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

Cadmium/cadmium oxides

Not combustible.

Ambient fire may liberate hazardous vapours.

### **5.3 Advice for firefighters**

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

### **5.4 Further information**

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.

Air sensitive.

#### **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                                                                                   |
|-----------|-----------|----------------------------------------|-------------------------|-----------------------------------------------------------------------------------------|
| Cadmium   | 7440-43-9 | TWA                                    | 0.1 mg/m <sup>3</sup>   | USA. Occupational Exposure Limits (OSHA) - Table Z-2                                    |
|           |           | TWA                                    | 0.2 mg/m <sup>3</sup>   | USA. Occupational Exposure Limits (OSHA) - Table Z-2                                    |
|           |           | CEIL                                   | 0.3 mg/m <sup>3</sup>   | USA. Occupational Exposure Limits (OSHA) - Table Z-2                                    |
|           |           | CEIL                                   | 0.6 mg/m <sup>3</sup>   | USA. Occupational Exposure Limits (OSHA) - Table Z-2                                    |
|           |           | PEL                                    | 0.005 mg/m <sup>3</sup> | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|           | Remarks   | Potential Occupational Carcinogen      |                         |                                                                                         |
|           |           | TWA                                    | 0.01 mg/m <sup>3</sup>  | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|           |           | Suspected human carcinogen             |                         |                                                                                         |
|           |           | TWA                                    | 0.02 mg/m <sup>3</sup>  | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|           |           | Suspected human carcinogen             |                         |                                                                                         |
|           |           | PEL                                    | 0.005 mg/m <sup>3</sup> | OSHA Specifically Regulated Chemicals/Carcinogens                                       |
|           |           | OSHA specifically regulated carcinogen |                         |                                                                                         |

#### Biological occupational exposure limits

| Component | CAS-No.   | Parameters   | Value            | Biological specimen | Basis                                     |
|-----------|-----------|--------------|------------------|---------------------|-------------------------------------------|
| Cadmium   | 7440-43-9 | cadmium      | 5 µg/l           | In blood            | ACGIH - Biological Exposure Indices (BEI) |
|           | Remarks   | Not critical |                  |                     |                                           |
|           |           | cadmium      | 5µg/g creatinine | Urine               | ACGIH - Biological Exposure Indices (BEI) |
|           |           | Not critical |                  |                     |                                           |

### 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

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

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: 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: powder<br>Color: metallic                 |
| b) Odor                         | odorless                                        |
| c) Odor Threshold               | No data available                               |
| d) pH                           | No data available                               |
| e) Melting point/freezing point | Melting point/range: 320.9 °C (609.6 °F) - lit. |

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|    |                                              |                                                                       |
|----|----------------------------------------------|-----------------------------------------------------------------------|
| f) | Initial boiling point and boiling range      | 765 °C 1409 °F - lit.                                                 |
| g) | Flash point                                  | ( )Not applicable                                                     |
| h) | Evaporation rate                             | No data available                                                     |
| i) | Flammability (solid, gas)                    | The product is not flammable.                                         |
| j) | Upper/lower flammability or explosive limits | No data available                                                     |
| k) | Vapor pressure                               | 1.3 hPa at 394 °C (741 °F)                                            |
| l) | Vapor density                                | No data available                                                     |
| m) | Density                                      | 8.65 g/cm <sup>3</sup> at 25 °C (77 °F) - lit.                        |
|    | Relative density                             | 8.622 °C - Regulation (EC) No. 440/2008, Annex, A.3                   |
| n) | Water solubility                             | 2.3 g/l at 20 °C (68 °F) - OECD Test Guideline 105 - slightly soluble |
| o) | Partition coefficient: n-octanol/water       | Not applicable for inorganic substances                               |
| 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                                                                  |

## 9.2 Other safety information

No data available

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

### 10.3 Possibility of hazardous reactions

Risk of ignition or formation of inflammable gases or vapours with:  
in powder form  
with  
Air  
in powder form  
with  
Ammonia  
nitrile halides

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Risk of explosion with:  
hexafluorobenzene  
Hydrazoic acid  
ammonium nitrate  
with  
heat  
Zinc  
in powder form  
with  
Heat.  
Acid  
(generation of hydrogen)  
Exothermic reaction with:  
Alkali metals  
chlorates  
Strong oxidizing agents  
selenium  
in powder form  
Tellurium  
in powder form

#### **10.4 Conditions to avoid**

no information available

#### **10.5 Incompatible materials**

No data available

#### **10.6 Hazardous decomposition products**

In the event of fire: see section 5

---

### **SECTION 11: Toxicological information**

#### **11.1 Information on toxicological effects**

##### **Acute toxicity**

Oral: No data available

Acute toxicity estimate Inhalation - 4 h - 0.051 mg/l - dust/mist

(Expert judgment)

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**

Suspected of causing genetic defects.

##### **Carcinogenicity**

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Presumed to have carcinogenic potential for humans

IARC: 1 - Group 1: Carcinogenic to humans (Cadmium)

NTP: Known - Known to be human carcinogenThe reference note has been added by TD based on the background information of the NTP. (Cadmium)

OSHA: OSHA specifically regulated carcinogen (Cadmium)

**Reproductive toxicity**

Suspected of damaging the unborn child.

Suspected of damaging fertility.

**Specific target organ toxicity - single exposure**

No data available

**Specific target organ toxicity - repeated exposure**

Causes damage to organs through prolonged or repeated exposure.

**Aspiration hazard**

No data available

**11.2 Additional Information**

RTECS: EU9800000

Damage to the lungs., Kidney injury may occur., prolonged or repeated exposure can cause:, Vomiting, Diarrhea, Lung irritation

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 | flow-through test LC50 - Pimephales promelas (fathead minnow) - 1.5 mg/l - 96 h<br>Remarks: (ECHA) |
|------------------|----------------------------------------------------------------------------------------------------|

|                                                     |                                                                                               |
|-----------------------------------------------------|-----------------------------------------------------------------------------------------------|
| Toxicity to daphnia and other aquatic invertebrates | static test LC50 - Daphnia magna (Water flea) - 0.11 mg/l - 48 h<br>(OECD Test Guideline 202) |
|-----------------------------------------------------|-----------------------------------------------------------------------------------------------|

|                      |                                                                                      |
|----------------------|--------------------------------------------------------------------------------------|
| Toxicity to bacteria | static test NOEC - activated sludge - 0.0002 mg/l - 3 h<br>(OECD Test Guideline 209) |
|----------------------|--------------------------------------------------------------------------------------|

**12.2 Persistence and degradability**

The methods for determining the biological degradability are not applicable to inorganic substances.

**12.3 Bioaccumulative potential**

|                 |                                                                    |
|-----------------|--------------------------------------------------------------------|
| Bioaccumulation | Oncorhynchus mykiss (rainbow trout) - 72 d<br>- 1.27 µg/l(Cadmium) |
|-----------------|--------------------------------------------------------------------|

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**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 Endocrine disrupting properties**

No data available

**12.7 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.

---

**SECTION 14: Transport information**

**DOT (US)**

UN number: 3288    Class: 6.1    Packing group: II  
Proper shipping name: Toxic solid, inorganic, n.o.s. (Cadmium)  
Reportable Quantity (RQ): 10 lbs  
Reportable Quantity (RQ): 10 lbs  
Poison Inhalation Hazard: No

**IMDG**

UN number: 3288    Class: 6.1    Packing group: II    EMS-No: F-A, S-A  
Proper shipping name: TOXIC SOLID, INORGANIC, N.O.S. (Cadmium)  
Marine pollutant : yes

**IATA**

UN number: 3288    Class: 6.1    Packing group: II  
Proper shipping name: Toxic solid, inorganic, n.o.s. (Cadmium)

---

**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:

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Cadmium

CAS-No.  
7440-43-9

Revision Date  
2007-07-01

**SARA 311/312 Hazards**

Acute Health Hazard, Chronic Health Hazard

**Reportable Quantity** : D006 lbs

**Massachusetts Right To Know Components**

Cadmium

CAS-No.  
7440-43-9

Revision Date  
2007-07-01

**Pennsylvania Right To Know Components**

Cadmium

CAS-No.  
7440-43-9

Revision Date  
2007-07-01

**California Prop. 65 Components**

, which is/are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov). Cadmium

CAS-No.  
7440-43-9

Revision Date  
2009-02-01

---

**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: 6.9

Revision Date: 05/24/2023

Print Date: 10/07/2023

## SAFETY DATA SHEET

Version 6.7  
Revision Date 08/23/2023  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Chlorobenzene

Product Number : 284513  
Brand : Sigma-Aldrich  
Index-No. : 602-033-00-1  
CAS-No. : 108-90-7

**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)**

Flammable liquids (Category 3), H226  
Acute toxicity, Inhalation (Category 4), H332  
Skin irritation (Category 2), H315  
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

Warning

Hazard statement(s)

H226

Flammable liquid and vapor.

H315

Causes skin irritation.

H332

Harmful if inhaled.

H411

Toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P210

Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.

P233

Keep container tightly closed.

P240

Ground/bond container and receiving equipment.

P241

Use explosion-proof electrical/ ventilating/ lighting/ equipment.

P242

Use only non-sparking tools.

P243

Take precautionary measures against static discharge.

P261

Avoid breathing mist or vapors.

P264

Wash skin thoroughly after handling.

P271

Use only outdoors or in a well-ventilated area.

P273

Avoid release to the environment.

P280

Wear protective gloves/ eye protection/ face protection.

P303 + P361 + P353

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

P304 + P340 + P312

IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.

P332 + P313

If skin irritation occurs: Get medical advice/ attention.

P362

Take off contaminated clothing and wash before reuse.

P370 + P378

In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.

P391

Collect spillage.

P403 + P235

Store in a well-ventilated place. Keep cool.

P501

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

## 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

|                  |   |                                  |
|------------------|---|----------------------------------|
| Formula          | : | C <sub>6</sub> H <sub>5</sub> Cl |
| Molecular weight | : | 112.56 g/mol                     |
| CAS-No.          | : | 108-90-7                         |
| EC-No.           | : | 203-628-5                        |
| Index-No.        | : | 602-033-00-1                     |

| Component            | Classification                                              | Concentration |
|----------------------|-------------------------------------------------------------|---------------|
| <b>chlorobenzene</b> |                                                             |               |
|                      | Flam. Liq. 3; Acute Tox. 4;<br>Skin Irrit. 2; Aquatic Acute | <= 100 %      |

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|  |                                                          |  |
|--|----------------------------------------------------------|--|
|  | 2; Aquatic Chronic 2;<br>H226, H332, H315, H401,<br>H411 |  |
|--|----------------------------------------------------------|--|

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. If breathing stops: mouth-to-mouth breathing or artificial respiration. Oxygen if necessary. Immediately call in physician.

#### In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

#### In case of eye contact

After eye contact: rinse out with plenty of water. Remove contact lenses.

#### If swallowed

After swallowing: make victim drink water (two glasses at most). Consult doctor if feeling unwell.

### 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.

Vapors are heavier than air and may spread along floors.

Forms explosive mixtures with air at elevated temperatures.

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. Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

---

## SECTION 6: Accidental release measures

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

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. 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. Risk of explosion.

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

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent material (e.g. Chemisorb®). 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 safe handling

Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

#### 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

Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition.

#### Storage class

Storage class (TRGS 510): 3: Flammable liquids

### 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                                                                                   |
|---------------|----------|--------------------------------------------------------------|---------------------------------|-----------------------------------------------------------------------------------------|
| chlorobenzene | 108-90-7 | TWA                                                          | 10 ppm                          | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|               | Remarks  | Confirmed animal carcinogen with unknown relevance to humans |                                 |                                                                                         |
|               |          | TWA                                                          | 75 ppm<br>350 mg/m <sup>3</sup> | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|               |          | PEL                                                          | 10 ppm<br>46 mg/m <sup>3</sup>  | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |

#### Biological occupational exposure limits

| Component     | CAS-No.  | Parameters                      | Value              | Biological specimen | Basis                                     |
|---------------|----------|---------------------------------|--------------------|---------------------|-------------------------------------------|
| chlorobenzene | 108-90-7 | 4-Chlorocatechol                | 100mg/g creatinine | Urine               | ACGIH - Biological Exposure Indices (BEI) |
|               | Remarks  | End of shift at end of workweek |                    |                     |                                           |
|               |          | p-Chlorophenol                  | 20mg/g creatinine  | Urine               | ACGIH - Biological Exposure Indices (BEI) |
|               |          | End of shift at end of workweek |                    |                     |                                           |

### 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

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 EN 16523-1 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: Viton®

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Minimum layer thickness: 0.7 mm  
Break through time: 480 min  
Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

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 EN 16523-1 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: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 10 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

### **Body Protection**

Flame retardant antistatic protective clothing.

### **Respiratory protection**

Recommended Filter type: Filter A (acc. to DIN 3181) for vapours of organic compounds

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer.

These measures have to be properly documented.

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. Risk of explosion.

---

## **SECTION 9: Physical and chemical properties**

### **9.1 Information on basic physical and chemical properties**

- |                                            |                                             |
|--------------------------------------------|---------------------------------------------|
| a) Appearance                              | Form: liquid<br>Color: colorless            |
| b) Odor                                    | weak                                        |
| c) Odor Threshold                          | No data available                           |
| d) pH                                      | No data available                           |
| e) Melting point/freezing point            | Melting point/range: -45 °C (-49 °F) - lit. |
| f) Initial boiling point and boiling range | 132 °C 270 °F - lit.                        |
| g) Flash point                             | 27 °C (81 °F) - DIN 51755 Part 1            |
| h) Evaporation rate                        | No data available                           |
| i) Flammability (solid, gas)               | No data available                           |
| j) Upper/lower                             | Upper explosion limit: 11 %(V)              |

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|                                           |                                                                             |
|-------------------------------------------|-----------------------------------------------------------------------------|
| flammability or explosive limits          | Lower explosion limit: 1.3 %(V)                                             |
| k) Vapor pressure                         | 12.05 hPa at 20 °C (68 °F) - OECD Test Guideline 104                        |
| l) Vapor density                          | No data available                                                           |
| m) Density                                | 1.106 g/cm <sup>3</sup> at 25 °C (77 °F) - lit.                             |
| Relative density                          | No data available                                                           |
| n) Water solubility                       | 0.207 g/l at 20 °C (68 °F)                                                  |
| o) Partition coefficient: n-octanol/water | log Pow: 2.84 at 20 °C (68 °F) - - Bioaccumulation is not expected., (ECHA) |
| 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                                                                        |

## 9.2 Other safety information

No data available

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

Vapor/air-mixtures are explosive at intense warming.

### 10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

### 10.3 Possibility of hazardous reactions

Exothermic reaction with:

Alkali metals

Alkaline earth metals

Oxidizing agents

dimethyl sulfoxide

Nitric acid

Risk of explosion with:

sodium

in finely distributed form.

with

sodium

### 10.4 Conditions to avoid

Heating.

### 10.5 Incompatible materials

rubber

## 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 and female - > 2,000 mg/kg

(OECD Test Guideline 401)

LC50 Inhalation - Rat - male - 4 h - 15.57 mg/l - vapor

(OECD Test Guideline 403)

Dermal: No data available

#### Skin corrosion/irritation

Skin - Rabbit

Result: Skin irritation - 4 h

(OECD Test Guideline 404)

#### Serious eye damage/eye irritation

Eyes - Rabbit

Result: No eye irritation

(OECD Test Guideline 405)

#### Respiratory or skin sensitization

Local lymph node assay (LLNA) - Mouse

Result: negative

(OECD Test Guideline 429)

#### Germ cell mutagenicity

Test Type: Ames test

Test system: Salmonella typhimurium

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 471

Result: negative

Test Type: Mutagenicity (mammal cell test):

Test system: Chinese hamster lung cells

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 476

Result: negative

Test Type: Mutagenicity (mammal cell test): chromosome aberration.

Test system: Chinese hamster ovary cells

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 473

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

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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: CZ0175000

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

Systemic effects:

CNS disorders

tachycardia

drop in blood pressure

agitation, spasms

ataxia (impaired locomotor coordination)

narcosis

Headache

Damage to:

Liver

Kidney

Handle in accordance with good industrial hygiene and safety practice.

---

**SECTION 12: Ecological information**

**12.1 Toxicity**

|                                                     |                                                                                                                |
|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| Toxicity to fish                                    | static test LC50 - <i>Lepomis macrochirus</i> (Bluegill sunfish) - 4.5 mg/l - 96 h<br>Remarks: (ECHA)          |
| Toxicity to daphnia and other aquatic invertebrates | static test EC50 - <i>Daphnia magna</i> (Water flea) - 26 mg/l - 48 h<br>(OECD Test Guideline 202)             |
| Toxicity to algae                                   | static test EC10 - <i>Desmodesmus subspicatus</i> (green algae) - 5.8 mg/l - 72 h<br>(OECD Test Guideline 201) |

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|                                                                       |                                                                                                                  |
|-----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
|                                                                       | static test ErC50 - <i>Desmodesmus subspicatus</i> (green algae) - 11.4 mg/l - 72 h<br>(OECD Test Guideline 201) |
| Toxicity to bacteria                                                  | static test EC50 - activated sludge - 140 mg/l - 30 min<br>(OECD Test Guideline 209)                             |
| Toxicity to fish(Chronic toxicity)                                    | semi-static test NOEC - <i>Danio rerio</i> (zebra fish) - 4.8 mg/l - 28 d<br>(OECD Test Guideline 210)           |
| Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity) | flow-through test NOEC - <i>Daphnia magna</i> (Water flea) - 0.72 mg/l - 21 d<br>(OECD Test Guideline 211)       |

## 12.2 Persistence and degradability

|                           |                                                                                                                                                                                                                   |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Biodegradability          | aerobic - Exposure time 28 d<br>Result: 15 % - Not readily biodegradable.<br>(OECD Test Guideline 301F)<br>aerobic - Exposure time 28 d<br>Result: 0 % - Not readily biodegradable.<br>(OECD Test Guideline 301C) |
| Theoretical oxygen demand | 2,060 mg/g<br>Remarks: (Lit.)                                                                                                                                                                                     |
| Ratio BOD/ThBOD           | 1.5 %<br>Remarks: (Lit.)                                                                                                                                                                                          |

## 12.3 Bioaccumulative potential

|                 |                                                                                                                                              |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| Bioaccumulation | <i>Cyprinus carpio</i> (Carp) - 49 d<br>at 25 °C(chlorobenzene)<br><br>Bioconcentration factor (BCF): 3.9 - 23<br>(OECD Test Guideline 305C) |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------|

## 12.4 Mobility in soil

No data available

## 12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

## 12.6 Endocrine disrupting properties

No data available

## 12.7 Other adverse effects

Discharge into the environment must be avoided.

---

## SECTION 13: Disposal considerations

### 13.1 Waste treatment methods

#### Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See [www.retrologistik.com](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: 1134 Class: 3 Packing group: III  
Proper shipping name: Chlorobenzene  
Reportable Quantity (RQ): 100 lbs  
Reportable Quantity (RQ): 100 lbs  
Poison Inhalation Hazard: No

#### IMDG

UN number: 1134 Class: 3 Packing group: III EMS-No: F-E, S-D  
Proper shipping name: CHLOROBENZENE  
Marine pollutant : yes

#### IATA

UN number: 1134 Class: 3 Packing group: III  
Proper shipping name: Chlorobenzene

---

## 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 |
|---------------|----------|---------------|
| chlorobenzene | 108-90-7 | 2007-07-01    |

#### SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard

:  
**Reportable Quantity** D021 lbs

#### Massachusetts Right To Know Components

|               | CAS-No.  | Revision Date |
|---------------|----------|---------------|
| chlorobenzene | 108-90-7 | 2007-07-01    |

#### Pennsylvania Right To Know Components

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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: 6.7

Revision Date: 08/23/2023

Print Date: 10/07/2023



## SAFETY DATA SHEET

Version 6.5  
Revision Date 07/22/2022  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Chromium

Product Number : 266299  
Brand : Aldrich  
CAS-No. : 7440-47-3

**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**

Not a hazardous substance or mixture.

**2.2 GHS Label elements, including precautionary statements**

Not a hazardous substance or mixture.

**2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none****SECTION 3: Composition/information on ingredients****3.1 Substances**

Formula : Cr  
Molecular weight : 52.00 g/mol  
CAS-No. : 7440-47-3  
EC-No. : 231-157-5

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| Component       | Classification | Concentration |
|-----------------|----------------|---------------|
| <b>chromium</b> |                |               |
|                 |                | <= 100 %      |

---

## SECTION 4: First aid measures

### 4.1 Description of first-aid measures

#### General advice

Move out of dangerous area.

#### 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

Chromium 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

#### 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

General industrial hygiene practice.

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.

Air sensitive. Keep in a dry place.

#### Storage class

Storage class (TRGS 510): 13: Non Combustible Solids

### 7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

---

## SECTION 8: Exposure controls/personal protection

### 8.1 Control parameters

#### Ingredients with workplace control parameters

| Component | CAS-No.   | Value | Control parameters    | Basis                                                                                   |
|-----------|-----------|-------|-----------------------|-----------------------------------------------------------------------------------------|
| chromium  | 7440-47-3 | TWA   | 0.5 mg/m <sup>3</sup> | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|           |           | PEL   | 0.5 mg/m <sup>3</sup> | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|           |           | TWA   | 1 mg/m <sup>3</sup>   | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |

#### Biological occupational exposure limits

| Component | CAS-No. | Parameters | Value | Biological specimen | Basis |
|-----------|---------|------------|-------|---------------------|-------|
|-----------|---------|------------|-------|---------------------|-------|

|          |           |                                 |          |       |                                           |
|----------|-----------|---------------------------------|----------|-------|-------------------------------------------|
| chromium | 7440-47-3 | Total chromium                  | 0.7 µg/l | Urine | ACGIH - Biological Exposure Indices (BEI) |
|          | Remarks   | End of shift at end of workweek |          |       |                                           |

## 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<br>Color: light gray               |
| b) Odor                                         | odorless                                        |
| c) Odor Threshold                               | No data available                               |
| d) pH                                           | No data available                               |
| e) Melting point/freezing point                 | Melting point/range: 1,857 °C (3,375 °F) - lit. |
| f) Initial boiling point and boiling range      | 2,672 °C 4,842 °F - lit.                        |
| g) Flash point                                  | ( )Not applicable                               |
| h) Evaporation rate                             | No data available                               |
| i) Flammability (solid, gas)                    | No data available                               |
| j) Upper/lower flammability or explosive limits | No data available                               |
| k) Vapor pressure                               | No data available                               |
| l) Vapor density                                | No data available                               |
| m) Density                                      | 7.14 g/mL at 25 °C (77 °F) - lit.               |
| Relative density                                | No data available                               |
| n) Water solubility                             | insoluble                                       |
| o) Partition coefficient: n-octanol/water       | Not applicable for inorganic substances         |
| 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                                            |

### 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 acids, 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**

Oral: 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

### **11.2 Additional Information**

RTECS: GB4200000

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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 - Cyprinus carpio (Carp) - 14.3 mg/l - 96 h

Toxicity to daphnia              EC50 - Daphnia magna (Water flea) - 0.07 mg/l - 48 h  
and other aquatic  
invertebrates

### 12.2 Persistence and degradability

The methods for determining biodegradability are not applicable to inorganic substances.

### 12.3 Bioaccumulative potential

Bioaccumulation                  Oncorhynchus mykiss (rainbow trout) - 30 d  
- 50 µg/l(chromium)

Bioconcentration factor (BCF): 1.03 - 1.22

### 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 Endocrine disrupting properties

No data available

### 12.7 Other adverse effects

No data available

---

## SECTION 13: Disposal considerations

### 13.1 Waste treatment methods

#### Product

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

#### Contaminated packaging

Dispose of as unused product.

---

## SECTION 14: Transport information

### DOT (US)

UN number: 3077    Class: 9

Packing group: III

Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (chromium)

Reportable Quantity (RQ): 5000 lbs

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Reportable Quantity (RQ): 10 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:

|          |                      |                             |
|----------|----------------------|-----------------------------|
| chromium | CAS-No.<br>7440-47-3 | Revision Date<br>2007-07-01 |
|----------|----------------------|-----------------------------|

**SARA 311/312 Hazards**

Chronic Health Hazard

**Reportable Quantity** : D007 lbs

**Massachusetts Right To Know Components**

No components are subject to the Massachusetts Right to Know Act.

**Pennsylvania Right To Know Components**

|          |                      |                             |
|----------|----------------------|-----------------------------|
| chromium | CAS-No.<br>7440-47-3 | Revision Date<br>2007-07-01 |
|----------|----------------------|-----------------------------|

---

**SECTION 16: Other information**

**Further information**

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Version: 6.5

Revision Date: 07/22/2022

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## SAFETY DATA SHEET

Version 6.8  
Revision Date 05/25/2023  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Cobalt

Product Number : 266647  
Brand : Aldrich  
Index-No. : 027-001-00-9  
CAS-No. : 7440-48-4

**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 solids (Category 1), H228  
Eye irritation (Category 2A), H319  
Respiratory sensitization (Category 1), H334  
Skin sensitization (Category 1), H317  
Germ cell mutagenicity (Category 2), H341  
Carcinogenicity (Category 1B), H350  
Reproductive toxicity (Category 1B), H360  
Long-term (chronic) aquatic hazard (Category 4), H413

For the full text of the H-Statements mentioned in this Section, see Section 16.

## 2.2 GHS Label elements, including precautionary statements

Pictogram



Signal Word

Danger

Hazard statement(s)

|      |                                                                            |
|------|----------------------------------------------------------------------------|
| H228 | Flammable solid.                                                           |
| H317 | May cause an allergic skin reaction.                                       |
| H319 | Causes serious eye irritation.                                             |
| H334 | May cause allergy or asthma symptoms or breathing difficulties if inhaled. |
| H341 | Suspected of causing genetic defects.                                      |
| H350 | May cause cancer.                                                          |
| H360 | May damage fertility or the unborn child.                                  |
| H413 | May cause long lasting harmful effects to aquatic life.                    |

Precautionary statement(s)

|                    |                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------|
| P201               | Obtain special instructions before use.                                                                                          |
| P202               | Do not handle until all safety precautions have been read and understood.                                                        |
| 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.                                                                |
| P261               | Avoid breathing dust.                                                                                                            |
| P264               | Wash skin thoroughly after handling.                                                                                             |
| P272               | Contaminated work clothing must not be allowed out of the workplace.                                                             |
| P273               | Avoid release to the environment.                                                                                                |
| P280               | Wear protective gloves/ protective clothing/ eye protection/ face protection.                                                    |
| P285               | In case of inadequate ventilation wear respiratory protection.                                                                   |
| P302 + P352        | IF ON SKIN: Wash with plenty of soap and water.                                                                                  |
| P304 + P341        | IF INHALED: If breathing is difficult, remove person to fresh air and keep comfortable for breathing.                            |
| P305 + P351 + P338 | IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. |
| P308 + P313        | IF exposed or concerned: Get medical advice/ attention.                                                                          |
| P333 + P313        | If skin irritation or rash occurs: Get medical advice/ attention.                                                                |
| P337 + P313        | If eye irritation persists: Get medical advice/ attention.                                                                       |
| P342 + P311        | If experiencing respiratory symptoms: Call a POISON CENTER/ doctor.                                                              |
| P363               | Wash contaminated clothing before reuse.                                                                                         |
| P370 + P378        | In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.                                             |
| 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

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## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Formula : Co  
Molecular weight : 58.93 g/mol  
CAS-No. : 7440-48-4  
EC-No. : 231-158-0  
Index-No. : 027-001-00-9

| Component     | Classification                                                                                                                                                             | Concentration |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>Cobalt</b> |                                                                                                                                                                            |               |
|               | Flam. Sol. 1; Eye Irrit. 2A;<br>Resp. Sens. 1; Skin Sens.<br>1; Muta. 2; Carc. 1B;<br>Repr. 1B; Aquatic Chronic<br>4; H228, H319, H334,<br>H317, H341, H350, H360,<br>H413 | <= 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

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. Consult a physician.

#### In case of eye contact

After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

#### If swallowed

After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

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## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

#### **Suitable extinguishing media**

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

#### **Unsuitable extinguishing media**

For this substance/mixture no limitations of extinguishing agents are given.

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

Cobalt/cobalt oxides

Not combustible.

Ambient fire may liberate hazardous vapours.

### 5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

### 5.4 Further information

Prevent fire extinguishing water from contaminating surface water or the ground water system.

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## 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. 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. Risk of explosion.

### 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.

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## SECTION 7: Handling and storage

### 7.1 Precautions for safe handling

#### **Advice on safe handling**

Work under hood. Do not inhale substance/mixture.

#### **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 away from heat and sources of ignition. Keep locked up or in an area accessible only to qualified or authorized persons.

Air sensitive. Handle and store under inert gas.

### Storage class

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

| Component | CAS-No.   | Value                                                                                                             | Control parameters | Basis                                                                                   |
|-----------|-----------|-------------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------------------------------------------------------------------|
| Cobalt    | 7440-48-4 | TWA                                                                                                               | 0.05 mg/m3         | USA. NIOSH Recommended Exposure Limits                                                  |
|           |           | TWA                                                                                                               | 0.05 mg/m3         | USA. NIOSH Recommended Exposure Limits                                                  |
|           |           | TWA                                                                                                               | 0.1 mg/m3          | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|           |           | PEL                                                                                                               | 0.02 mg/m3         | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|           |           | TWA                                                                                                               | 0.005 mg/m3        | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|           | Remarks   | Respiratory sensitization<br>Suspected human carcinogen                                                           |                    |                                                                                         |
|           |           | TWA                                                                                                               | 0.02 mg/m3         | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|           |           | Dermal Sensitization<br>Respiratory sensitization<br>Confirmed animal carcinogen with unknown relevance to humans |                    |                                                                                         |

**Biological occupational exposure limits**

| Component | CAS-No.   | Parameters                      | Value   | Biological specimen | Basis                                     |
|-----------|-----------|---------------------------------|---------|---------------------|-------------------------------------------|
| Cobalt    | 7440-48-4 | Cobalt                          | 15 µg/l | Urine               | ACGIH - Biological Exposure Indices (BEI) |
|           | Remarks   | End of shift at end of workweek |         |                     |                                           |
|           |           | Cobalt                          |         | Urine               | ACGIH - Biological Exposure Indices (BEI) |
|           |           | End of shift at end of workweek |         |                     |                                           |

**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 Dermatrill® L

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: KCL 741 Dermatrill® L

**Body Protection**

Flame retardant antistatic 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. Risk of explosion.

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### SECTION 9: Physical and chemical properties

#### 9.1 Information on basic physical and chemical properties

|                                                 |                                                                    |
|-------------------------------------------------|--------------------------------------------------------------------|
| a) Appearance                                   | Form: powder                                                       |
| 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      | 2,900 °C 5,252 °F - lit.                                           |
| g) Flash point                                  | ( )Not applicable                                                  |
| 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) Density                                      | 8.9 g/mL at 25 °C (77 °F) - lit.                                   |
| Relative density                                | No data available                                                  |
| n) Water solubility                             | No data available                                                  |
| o) Partition coefficient: n-octanol/water       | log Pow: 5.0                                                       |
| 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                                                               |

#### 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

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

Oxidizing agents, Mineral acidsAcetylene, Hydrazinium nitrate, Material readily reacts with acids generating flammable and/or explosive hydrogen gas.

### 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 - Rat - 6,171 mg/kg

Remarks: Behavioral:Somnolence (general depressed activity).

Behavioral:Ataxia.

Diarrhea

Inhalation: No data available

Dermal: No data available

#### Skin corrosion/irritation

No data available

#### Serious eye damage/eye irritation

Eyes - Rabbit

Result: Causes serious eye irritation.

(OECD Test Guideline 405)

#### Respiratory or skin sensitization

May cause allergic respiratory and skin reactions

#### Germ cell mutagenicity

Suspected of causing genetic defects.

#### Carcinogenicity

Presumed to have carcinogenic potential for humans

IARC: 2A - Group 2A: Probably carcinogenic to humans (Cobalt)

2A - Group 2A: Probably carcinogenic to humans (Cobalt)

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is

on OSHA's list of regulated carcinogens.

**Reproductive toxicity**

May damage fertility.

**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: GF8750000

Kidney injury may occur., Damage to the eyes., Lung irritation, Throat., Rash, Vomiting, Diarrhea

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

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**SECTION 12: Ecological information**

**12.1 Toxicity**

|                                                     |                                                                                                                 |
|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| Toxicity to fish                                    | LC50 - Danio rerio (zebra fish) - 100.01 mg/l - 96 h                                                            |
| Toxicity to daphnia and other aquatic invertebrates | static test EC50 - Daphnia magna (Water flea) - > 100 mg/l - 48 h (OECD Test Guideline 202)                     |
| Toxicity to algae                                   | static test ErC50 - Pseudokirchneriella subcapitata (green algae) - 0.270 mg/l - 70 h (OECD Test Guideline 201) |

**12.2 Persistence and degradability**

The methods for determining biodegradability are not applicable to inorganic substances.

**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 Endocrine disrupting properties**

No data available

**12.7 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.

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## SECTION 14: Transport information

#### DOT (US)

UN number: 3089    Class: 4.1    Packing group: II  
Proper shipping name: Metal powders, flammable, n.o.s.  
Reportable Quantity (RQ):  
Poison Inhalation Hazard: No

#### IMDG

UN number: 3089    Class: 4.1    Packing group: II    EMS-No: F-G, S-G  
Proper shipping name: METAL POWDER, FLAMMABLE, N.O.S.

#### IATA

UN number: 3089    Class: 4.1    Packing group: II  
Proper shipping name: Metal powder, flammable, n.o.s.

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## 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 |
|--------|-----------|---------------|
| Cobalt | 7440-48-4 | 1989-08-11    |

#### SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

#### Massachusetts Right To Know Components

|        | CAS-No.   | Revision Date |
|--------|-----------|---------------|
| Cobalt | 7440-48-4 | 1989-08-11    |

#### Pennsylvania Right To Know Components

|        | CAS-No.   | Revision Date |
|--------|-----------|---------------|
| Cobalt | 7440-48-4 | 1989-08-11    |

#### California Prop. 65 Components

| , which is/are known to the State of California to | CAS-No. | Revision Date |
|----------------------------------------------------|---------|---------------|
|----------------------------------------------------|---------|---------------|

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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: 6.8

Revision Date: 05/25/2023

Print Date: 10/07/2023

## SAFETY DATA SHEET

Version 8.9  
Revision Date 08/23/2023  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Copper

Product Number : 774081  
Brand : Aldrich  
Index-No. : 029-024-00-X  
CAS-No. : 7440-50-8

**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)**

Flammable solids (Category 2), H228  
Self-heating chemicals (Category 1), H251  
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)        |                                                                                      |
| H228                       | Flammable solid.                                                                     |
| H251                       | Self-heating; may catch fire.                                                        |
| H410                       | Very toxic to aquatic life with long lasting effects.                                |
| Precautionary statement(s) |                                                                                      |
| P210                       | Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.                  |
| P235 + P410                | Keep cool. Protect from sunlight.                                                    |
| P240                       | Ground/bond container and receiving equipment.                                       |
| P241                       | Use explosion-proof electrical/ ventilating/ lighting/ equipment.                    |
| P273                       | Avoid release to the environment.                                                    |
| P280                       | Wear protective gloves/ eye protection/ face protection.                             |
| P370 + P378                | In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish. |
| P391                       | Collect spillage.                                                                    |
| P403 + P235                | Store in a well-ventilated place. Keep cool.                                         |
| P407                       | Maintain air gap between stacks/ pallets.                                            |
| P420                       | Store away from other materials.                                                     |
| 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          | : Cu           |
| Molecular weight | : 63.54 g/mol  |
| CAS-No.          | : 7440-50-8    |
| EC-No.           | : 231-159-6    |
| Index-No.        | : 029-024-00-X |

| Component                | Classification                                                                                                                    | Concentration |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>Copper nanopowder</b> |                                                                                                                                   |               |
|                          | Flam. Sol. 2; 1; Aquatic Acute 1; Aquatic Chronic 1; H228, H251, H400, H410<br>M-Factor - Aquatic Acute: 10 - Aquatic Chronic: 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

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.

#### In case of eye contact

After eye contact: rinse out with plenty of water. Remove contact lenses.

#### If swallowed

After swallowing: make victim drink water (two glasses at most). Consult doctor if feeling unwell.

### 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

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

Copper oxides

Combustible.

Development of hazardous combustion gases or vapours possible in the event of fire.

### 5.3 Advice for firefighters

In the event of fire, wear self-contained breathing apparatus.

### 5.4 Further information

Prevent fire extinguishing water from contaminating surface water or the ground water system.

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## 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. 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. Risk of explosion.

### 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 dry. Dispose of properly. Clean up affected area. Avoid generation of dusts.

### 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 protection against fire and explosion

Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharge.

#### Hygiene measures

Change contaminated clothing. Wash hands after working with substance.  
For precautions see section 2.2.

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

#### Storage conditions

Tightly closed. Keep away from heat and sources of ignition.

Handle and store under inert gas. Air sensitive.

#### Storage class

Storage class (TRGS 510): 4.2: Pyrophoric and self-heating hazardous materials

### 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                                                                                   |
|-------------------|-----------|-------|--------------------|-----------------------------------------------------------------------------------------|
| Copper nanopowder | 7440-50-8 | TWA   | 1 mg/m3            | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|                   |           | TWA   | 0.2 mg/m3          | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|                   |           | TWA   | 1 mg/m3            | USA. NIOSH Recommended Exposure Limits                                                  |
|                   |           | TWA   | 1 mg/m3            | USA. NIOSH Recommended Exposure Limits                                                  |
|                   |           | TWA   | 1 mg/m3            | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|                   |           | TWA   | 0.1 mg/m3          | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|                   |           | PEL   | 0.1 mg/m3          | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|                   |           | TWA   | 0.1 mg/m3          | USA. Table Z-1-A Limits for Air Contaminants (1989 vacated values)                      |
|                   |           | TWA   | 1 mg/m3            | USA. Table Z-1-A Limits for Air Contaminants (1989 vacated values)                      |

## 8.2 Exposure controls

### Appropriate engineering controls

Change contaminated clothing. Wash hands after working with substance.

### Personal protective equipment

#### Eye/face protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). 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 EN 16523-1 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**

Flame retardant antistatic protective clothing.

### **Respiratory protection**

Recommended Filter type: Filter type P1

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer.

These measures have to be properly documented.

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. Risk of explosion.

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## **SECTION 9: Physical and chemical properties**

### **9.1 Information on basic physical and chemical properties**

- |                                                 |                                                                               |
|-------------------------------------------------|-------------------------------------------------------------------------------|
| a) Appearance                                   | Form: powder<br>Color: copper, colored                                        |
| b) Odor                                         | No data available                                                             |
| c) Odor Threshold                               | No data available                                                             |
| d) pH                                           | No data available                                                             |
| e) Melting point/freezing point                 | Melting point: 1,059 °C (1,938 °F) - Regulation (EC) No. 440/2008, Annex, A.1 |
| f) Initial boiling point and boiling range      | 2,595 °C 4,703 °F                                                             |
| g) Flash point                                  | ( )Not applicable                                                             |
| h) Evaporation rate                             | No data available                                                             |
| i) Flammability (solid, gas)                    | The substance or mixture is a flammable solid with the category 2.            |
| j) Upper/lower flammability or explosive limits | No data available                                                             |
| k) Vapor pressure                               | No data available                                                             |
| l) Vapor density                                | No data available                                                             |
| m) Density                                      | ca.8.78 g/cm <sup>3</sup> at 20 °C (68 °F)                                    |
| Relative density                                | No data available                                                             |
| n) Water solubility                             | 0.001 g/l at 30 °C (86 °F) - OECD Test Guideline 105 - insoluble              |
| o) Partition coefficient:                       | No data available                                                             |

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n-octanol/water

- |    |                           |                               |
|----|---------------------------|-------------------------------|
| p) | Autoignition temperature  | Self-heating; may catch fire. |
| q) | Decomposition temperature | No data available             |
| r) | Viscosity                 | No data available             |
| s) | Explosive properties      | No data available             |
| t) | Oxidizing properties      | none                          |

## 9.2 Other safety information

No data available

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

Self-heating; may catch fire.

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

Exothermic reaction with:

Ethylene oxide

Fluorine

hydrogen sulphide

halogen-halogen compounds

alkali oxides

nitrides

Salts of hydrazine

Sulfuric acid

Risk of ignition or formation of inflammable gases or vapours with:

Oxidizing agents

Chlorine

Risk of explosion with:

Acetylene

azides

ammonium compounds

iodates

bromopropine

perchlorates

bromates

picrates

chlorates

Peroxides

#### **10.4 Conditions to avoid**

no information available

#### **10.5 Incompatible materials**

No data available

#### **10.6 Hazardous decomposition products**

In the event of fire: see section 5

---

### **SECTION 11: Toxicological information**

#### **11.1 Information on toxicological effects**

##### **Acute toxicity**

Oral: No data available

Inhalation: No data available

Dermal: No data available

##### **Skin corrosion/irritation**

No data available

##### **Serious eye damage/eye irritation**

No data available

##### **Respiratory or skin 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

#### **11.2 Additional Information**

RTECS: GL5325000

Symptoms of systemic copper poisoning may include: capillary damage, headache, cold sweat, weak pulse, and kidney and liver damage, central nervous system excitation followed by depression, jaundice, convulsions, paralysis, and coma. Death may occur from shock or renal failure. Chronic copper poisoning is typified by hepatic cirrhosis, brain

damage and demyelination, kidney defects, and copper deposition in the cornea as exemplified by humans with Wilson's disease. It has also been reported that copper poisoning has lead to hemolytic anemia and accelerates arteriosclerosis., Damage to the lungs., Vomiting, Diarrhea, Abdominal pain, Blood disorders  
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Liver - Irregularities - Based on Human Evidence

---

## SECTION 12: Ecological information

### 12.1 Toxicity

|                  |                                                                                             |
|------------------|---------------------------------------------------------------------------------------------|
| Toxicity to fish | LC50 - Oncorhynchus mykiss (rainbow trout) - 0.15 mg/l - 96 h<br>Remarks: (ECOTOX Database) |
|------------------|---------------------------------------------------------------------------------------------|

|                                                     |                                                                                           |
|-----------------------------------------------------|-------------------------------------------------------------------------------------------|
| Toxicity to daphnia and other aquatic invertebrates | EC50 - Daphnia magna (Water flea) - 0.04 - 0.05 mg/l - 48 h<br>Remarks: (ECOTOX Database) |
|-----------------------------------------------------|-------------------------------------------------------------------------------------------|

### 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 Endocrine disrupting properties

No data available

### 12.7 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.

---

## SECTION 14: Transport information

### DOT (US)

UN number: 3189    Class: 4.2    Packing group: II  
Proper shipping name: Metal powder, self-heating, n.o.s.  
Reportable Quantity (RQ):  
Marine pollutant: yes    Poison Inhalation Hazard: No

### IMDG

UN number: 3189    Class: 4.2    Packing group: II    EMS-No: F-G, S-J  
Proper shipping name: METAL POWDER, SELF-HEATING, N.O.S.  
Marine pollutant : yes

### IATA

UN number: 3189    Class: 4.2    Packing group: II  
Proper shipping name: Metal powder, self-heating, n.o.s.

---

## SECTION 15: Regulatory information

### SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

### SARA 313 Components

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

### SARA 311/312 Hazards

Fire 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

Copper nanopowder

CAS-No.  
7440-50-8

Revision Date  
1993-02-16

---

## 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: 8.9

Revision Date: 08/23/2023

Print Date: 10/07/2023

## SAFETY DATA SHEET

Version 6.8  
Revision Date 05/25/2023  
Print Date 08/12/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Ethylbenzene

Product Number : 296848  
Brand : Sigma-Aldrich  
Index-No. : 601-023-00-4  
CAS-No. : 100-41-4

**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 2), H225  
Acute toxicity, Inhalation (Category 4), H332  
Carcinogenicity (Category 2), H351  
Specific target organ toxicity - repeated exposure (Category 2), hearing organs, H373  
Aspiration hazard (Category 1), H304  
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**

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Pictogram



Signal Word

Danger

Hazard statement(s)

H225 Highly flammable liquid and vapor.  
H304 May be fatal if swallowed and enters airways.  
H332 Harmful if inhaled.  
H351 Suspected of causing cancer.  
H373 May cause damage to organs (hearing organs) through prolonged or repeated exposure.  
H401 Toxic to aquatic life.  
H412 Harmful to aquatic life with long lasting effects.

Precautionary statement(s)

P201 Obtain special instructions before use.  
P202 Do not handle until all safety precautions have been read and understood.  
P210 Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.  
P233 Keep container tightly closed.  
P240 Ground/bond container and receiving equipment.  
P241 Use explosion-proof electrical/ ventilating/ lighting/ equipment.  
P242 Use only non-sparking tools.  
P243 Take precautionary measures against static discharge.  
P260 Do not breathe mist or vapors.  
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 IF SWALLOWED: Immediately call a POISON CENTER/ doctor.  
P303 + P361 + P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.  
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.  
P331 Do NOT induce vomiting.  
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

Formula :  $C_8H_{10}$   
Molecular weight : 106.17 g/mol

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CAS-No. : 100-41-4  
EC-No. : 202-849-4  
Index-No. : 601-023-00-4

| Component           | Classification                                                                                                                                           | Concentration |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>ethylbenzene</b> |                                                                                                                                                          |               |
|                     | Flam. Liq. 2; Acute Tox. 4;<br>Carc. 2; STOT RE 2; Asp.<br>Tox. 1; Aquatic Acute 2;<br>Aquatic Chronic 3; H225,<br>H332, H351, H373, H304,<br>H401, H412 | <= 100 %      |

For the full text of the H-Statements mentioned in this Section, see Section 16.

---

## SECTION 4: First aid measures

### 4.1 Description of first-aid measures

#### General advice

Show this material safety data sheet to the doctor in attendance.

#### If inhaled

After inhalation: fresh air. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

#### In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

#### In case of eye contact

After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

#### If swallowed

After swallowing: caution if victim vomits. Risk of aspiration! Keep airways free. Pulmonary failure possible after aspiration of vomit. Call a physician immediately.

### 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 Carbon dioxide (CO2) Foam Dry powder

#### Unsuitable extinguishing media

For this substance/mixture no limitations of extinguishing agents are given.

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

Carbon oxides

Combustible.

Pay attention to flashback.

Vapors are heavier than air and may spread along floors.

Development of hazardous combustion gases or vapours possible in the event of fire.

Forms explosive mixtures with air at ambient temperatures.

## **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. Risk of explosion.

### **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 safe handling**

Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

#### **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**

Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.

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. Keep away from heat and sources of ignition.

hygroscopic

### Storage class

Storage class (TRGS 510): 3: Flammable liquids

### 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                                                                                   |
|--------------|----------|-------|----------------------------------|-----------------------------------------------------------------------------------------|
| ethylbenzene | 100-41-4 | TWA   | 100 ppm<br>435 mg/m <sup>3</sup> | USA. NIOSH Recommended Exposure Limits                                                  |
|              |          | ST    | 125 ppm<br>545 mg/m <sup>3</sup> | USA. NIOSH Recommended Exposure Limits                                                  |
|              |          | TWA   | 100 ppm<br>435 mg/m <sup>3</sup> | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|              |          | STEL  | 30 ppm<br>130 mg/m <sup>3</sup>  | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|              |          | PEL   | 5 ppm<br>22 mg/m <sup>3</sup>    | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |

#### Biological occupational exposure limits

| Component    | CAS-No.  | Parameters                                               | Value              | Biological specimen | Basis                                     |
|--------------|----------|----------------------------------------------------------|--------------------|---------------------|-------------------------------------------|
| ethylbenzene | 100-41-4 | Sum of mandelic acid and phenyl glyoxylic acid           | 0.15g/g creatinine | Urine               | ACGIH - Biological Exposure Indices (BEI) |
|              | Remarks  | End of shift (As soon as possible after exposure ceases) |                    |                     |                                           |

### 8.2 Exposure controls

#### Appropriate engineering controls

Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.

## Personal protective equipment

### Eye/face protection

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

### 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: Viton®

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

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: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 10 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

### Body Protection

Flame retardant antistatic 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. Risk of explosion.

---

## SECTION 9: Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

- |                                 |                                                           |
|---------------------------------|-----------------------------------------------------------|
| a) Appearance                   | Form: liquid<br>Color: colorless                          |
| b) Odor                         | aromatic                                                  |
| c) Odor Threshold               | No data available                                         |
| d) pH                           | No data available                                         |
| e) Melting point/freezing point | Melting point: -94.9 °C (-138.8 °F) at 101.3 hPa - (ECHA) |
| f) Initial boiling point        | 136.1 °C 277.0 °F at 1,013.3 hPa                          |

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|    |                                              |                                                                                                                                                 |
|----|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
|    | and boiling range                            |                                                                                                                                                 |
| g) | Flash point                                  | 22.0 °C (71.6 °F) - closed cup                                                                                                                  |
| h) | Evaporation rate                             | No data available                                                                                                                               |
| i) | Flammability (solid, gas)                    | No data available                                                                                                                               |
| j) | Upper/lower flammability or explosive limits | Upper explosion limit: 6.7 %(V)<br>Lower explosion limit: 1 %(V)                                                                                |
| k) | Vapor pressure                               | 9.52 hPa at 20 °C (68 °F) - OECD Test Guideline 104                                                                                             |
| l) | Vapor density                                | No data available                                                                                                                               |
| m) | Density                                      | 0.87 g/cm <sup>3</sup> at 20 °C (68 °F)                                                                                                         |
|    | Relative density                             | 0.86 - 0.8720 °C                                                                                                                                |
| n) | Water solubility                             | 0.2 g/l at 25 °C (77 °F) - Regulation (EC) No. 440/2008, Annex, A.6 - slightly soluble                                                          |
| o) | Partition coefficient: n-octanol/water       | log Pow: 3.6 at 20 °C (68 °F) - Regulation (EC) No. 440/2008, Annex, A.8 - Bioaccumulation is not expected.                                     |
| p) | Autoignition temperature                     | 430 °C (806 °F) at 1,013 hPa                                                                                                                    |
| q) | Decomposition temperature                    | No data available                                                                                                                               |
| r) | Viscosity                                    | 0.773 mm <sup>2</sup> /s at 20 °C (68 °F) - OECD Test Guideline 114 -<br>0.641 mm <sup>2</sup> /s at 40 °C (104 °F) - OECD Test Guideline 114 - |
| s) | Explosive properties                         | No data available                                                                                                                               |
| t) | Oxidizing properties                         | none                                                                                                                                            |

## 9.2 Other safety information

|                 |                                                          |
|-----------------|----------------------------------------------------------|
| Surface tension | 71.2 mN/m at 0.058g/l at 23 °C (73 °F) - Surface tension |
|-----------------|----------------------------------------------------------|

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

Vapors may form explosive mixture with air.

### 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  
rubber  
various plastics

### 10.4 Conditions to avoid

Warming.

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## 10.5 Incompatible materials

No data available

## 10.6 Hazardous decomposition products

In the event of fire: see section 5

---

## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

#### Acute toxicity

LD50 Oral - Rat - male and female - 3,500 mg/kg

Remarks: (ECHA)

LC50 Inhalation - Rat - male - 4 h - 17.8 mg/l - vapor

Remarks: (ECHA)

LD50 Dermal - Rabbit - 15,433 mg/kg

Remarks: (RTECS)

#### Skin corrosion/irritation

Skin - Rabbit

Result: Moderate skin irritation - 24 h

Remarks: (ECHA)

#### Serious eye damage/eye irritation

Eyes - Rabbit

Result: Mild eye irritation

Remarks: (ECHA)

#### Respiratory or skin sensitization

No data available

#### Germ cell mutagenicity

Test Type: Chromosome aberration test in vitro

Test system: Chinese hamster ovary cells

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 473

Result: negative

Test Type: In vitro mammalian cell gene mutation test

Test system: mouse lymphoma cells

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 476

Result: negative

Test Type: Micronucleus test

Species: Mouse

Cell type: Bone marrow

Application Route: Oral

Method: OECD Test Guideline 474

Result: negative

Test Type: unscheduled DNA synthesis assay

Species: Mouse

Application Route: Inhalation  
Method: OECD Test Guideline 486  
Result: negative

### **Carcinogenicity**

IARC: 2B - Group 2B: Possibly carcinogenic to humans (ethylbenzene)  
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.  
- hearing organs

Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

### **Aspiration hazard**

Aspiration may cause pulmonary edema and pneumonitis.

## **11.2 Additional Information**

Repeated dose toxicity - Rat - male and female - Oral - 28 d - NOAEL (No observed adverse effect level) - 75 mg/kg

RTECS: DA0700000

Central nervous system depression, Nausea, Headache, Vomiting, Ataxia., Tremors  
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Systemic effects:

CNS disorders  
Tiredness  
Drowsiness  
Dizziness  
Convulsions  
Headache  
narcosis

Handle in accordance with good industrial hygiene and safety practice.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence



---

## SECTION 12: Ecological information

### 12.1 Toxicity

|                                                     |                                                                                                                   |
|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| Toxicity to fish                                    | semi-static test LC50 - <i>Oncorhynchus mykiss</i> (rainbow trout) - 4.2 mg/l - 96 h<br>(OECD Test Guideline 203) |
| Toxicity to daphnia and other aquatic invertebrates | static test EC50 - <i>Daphnia magna</i> (Water flea) - 1.8 - 2.4 mg/l - 48 h<br>(US-EPA)                          |
| Toxicity to algae                                   | static test EC50 - <i>Pseudokirchneriella subcapitata</i> (green algae) - 3.6 mg/l - 96 h<br>(US-EPA)             |
| Toxicity to bacteria                                | EC50 - <i>Photobacterium phosphoreum</i> - 9.68 mg/l - 30 min<br>Remarks: (IUCLID)                                |

### 12.2 Persistence and degradability

|                  |                                                                                         |
|------------------|-----------------------------------------------------------------------------------------|
| Biodegradability | aerobic - Exposure time 28 d<br>Result: ca.79 % - Readily biodegradable.<br>(ISO 14593) |
|------------------|-----------------------------------------------------------------------------------------|

### 12.3 Bioaccumulative potential

Due to the distribution coefficient n-octanol/water, accumulation in organisms is not expected.

### 12.4 Mobility in soil

No data available

### 12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

### 12.6 Endocrine disrupting properties

No data available

### 12.7 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.

---

**SECTION 14: Transport information****DOT (US)**

UN number: 1175    Class: 3    Packing group: II  
Proper shipping name: Ethylbenzene  
Reportable Quantity (RQ): 1000 lbs  
Reportable Quantity (RQ): 100 lbs  
Poison Inhalation Hazard: No

**IMDG**

UN number: 1175    Class: 3    Packing group: II    EMS-No: F-E, S-D  
Proper shipping name: ETHYLBENZENE

**IATA**

UN number: 1175    Class: 3    Packing group: II  
Proper shipping name: Ethylbenzene

---

**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 |
|--------------|----------|---------------|
| ethylbenzene | 100-41-4 | 2007-07-01    |

**SARA 311/312 Hazards**

Fire Hazard, Chronic Health Hazard

:  
**Reportable Quantity**    F003 lbs

**Massachusetts Right To Know Components**

|              | CAS-No.  | Revision Date |
|--------------|----------|---------------|
| ethylbenzene | 100-41-4 | 2007-07-01    |

**Pennsylvania Right To Know Components**

|              | CAS-No.  | Revision Date |
|--------------|----------|---------------|
| ethylbenzene | 100-41-4 | 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.ethylbenzene">www.P65Warnings.ca.gov.ethylbenzene</a> | 100-41-4 | 2007-09-28    |

---

## 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: 6.8

Revision Date: 05/25/2023

Print Date: 08/12/2023

## SAFETY DATA SHEET

Version 6.6  
Revision Date 10/27/2021  
Print Date 08/12/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : 2-Aminopyridine

Product Number : A77997  
Brand : Aldrich  
CAS-No. : 504-29-0

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

Company : Sigma-Aldrich 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 1A), H314  
Serious eye damage (Category 1), H318  
Short-term (acute) aquatic hazard (Category 3), H402  
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

Aldrich - A77997

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|                            |                                                                                                                                                                            |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hazard statement(s)        |                                                                                                                                                                            |
| H301 + H311                | Toxic if swallowed or in contact with skin.                                                                                                                                |
| H314                       | Causes severe skin burns and eye damage.                                                                                                                                   |
| H412                       | Harmful 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.                                                                                                                      |
| 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         | : 2-Pyridylamine<br>2-Pyridinamine<br>2-AP     |
| Formula          | : C <sub>5</sub> H <sub>6</sub> N <sub>2</sub> |
| Molecular weight | : 94.11 g/mol                                  |
| CAS-No.          | : 504-29-0                                     |
| EC-No.           | : 207-988-4                                    |

| Component              | Classification                                                                                                  | Concentration |
|------------------------|-----------------------------------------------------------------------------------------------------------------|---------------|
| <b>2-aminopyridine</b> |                                                                                                                 |               |
|                        | Acute Tox. 3; Skin Corr. 1A; Eye Dam. 1; Aquatic Acute 3; Aquatic Chronic 3; H301, H311, H314, H318, H402, H412 | <= 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. 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

Nitrogen oxides (NO<sub>x</sub>)

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. 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. 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. 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 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. 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                                                                                   |
|-----------------|----------|-------|--------------------------------|-----------------------------------------------------------------------------------------|
| 2-aminopyridine | 504-29-0 | TWA   | 0.5 ppm                        | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|                 |          | TWA   | 0.5 ppm<br>2 mg/m <sup>3</sup> | USA. NIOSH Recommended Exposure Limits                                                  |
|                 |          | TWA   | 0.5 ppm<br>2 mg/m <sup>3</sup> | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|                 |          | TWA   | 0.5 ppm<br>2 mg/m <sup>3</sup> | USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000                           |
|                 |          | PEL   | 0.5 ppm<br>2 mg/m <sup>3</sup> | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |

## 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: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: KCL 741 Dermatrill® L

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: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: KCL 741 Dermatrill® L

#### Body Protection

Flame retardant antistatic 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: crystalline<br>Color: light yellow              |
| b) Odor                                         | No data available                                     |
| c) Odor Threshold                               | No data available                                     |
| d) pH                                           | No data available                                     |
| e) Melting point/freezing point                 | Melting point/range: 54 - 58 °C (129 - 136 °F) - lit. |
| f) Initial boiling point and boiling range      | 204 - 210 °C 399 - 410 °F - lit.                      |
| g) Flash point                                  | 92 °C (198 °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) Density                                      | 1.065 g/cm <sup>3</sup> at 20 °C (68 °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                         | none                                                  |

**9.2 Other safety information**

No data available

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

Forms explosive mixtures with air on intense heating.

A range from approx. 15 Kelvin below the flash point is to be rated as critical.

The following applies in general to flammable organic substances and mixtures: in correspondingly fine distribution, when whirled up a dust explosion potential may generally be assumed.

### 10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

### 10.3 Possibility of hazardous reactions

Violent reactions possible with:

Strong oxidizing agents  
acids

### 10.4 Conditions to avoid

Strong heating.

### 10.5 Incompatible materials

various plastics, Metals

### 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 - 200 mg/kg

Inhalation: No data available

LD50 Dermal - Guinea pig - 500 mg/kg

No data available

#### Skin corrosion/irritation

Skin - Rabbit

(OECD Test Guideline 404)

#### Serious eye damage/eye irritation

Eyes - chicken

(OECD Test Guideline 438)

#### 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

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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: US1575000

May cause convulsions.

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 - *Oryzias latipes* - 11 mg/l - 96 h  
(OECD Test Guideline 203)

Toxicity to daphnia  
and other aquatic  
invertebrates                      Immobilization EC50 - *Daphnia magna* (Water flea) - 35 mg/l - 48 h  
(OECD Test Guideline 202)

EC50 - *Tetrahymen pyriformis* - 393 mg/l - 60 h  
Remarks: (ECOTOX Database)

Toxicity to algae                      ErC50 - *Pseudokirchneriella subcapitata* - 12 mg/l - 72 h  
(OECD Test Guideline 201)

NOEC - *Pseudokirchneriella subcapitata* - 2.1 mg/l - 72 h  
(OECD Test Guideline 201)

**12.2 Persistence and degradability**

Biodegradability                      aerobic - Exposure time 28 d  
Result: 9.2 % - Not readily biodegradable.  
(OECD Test Guideline 301F)

**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 Endocrine disrupting properties

No data available

## 12.7 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: 2671    Class: 6.1    Packing group: II  
Proper shipping name: Aminopyridines  
Reportable Quantity (RQ):  
Poison Inhalation Hazard: No

### IMDG

UN number: 2671    Class: 6.1    Packing group: II    EMS-No: F-A, S-A  
Proper shipping name: AMINOPYRIDINES (o-, m-, p-)

### IATA

UN number: 2671    Class: 6.1    Packing group: II  
Proper shipping name: Aminopyridines

---

## SECTION 15: Regulatory information

### SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

### SARA 313 Components

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

### SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

### Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

---

## 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: 6.6

Revision Date: 10/27/2021

Print Date: 08/12/2023

## SAFETY DATA SHEET

Version 6.5  
Revision Date 09/27/2022  
Print Date 08/12/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Iron

Product Number : 12310  
Brand : Aldrich  
CAS-No. : 7439-89-6

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

Identified uses : Laboratory chemicals, 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 solids (Category 1), H228  
Self-heating chemicals (Category 1), H251

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.  
H251 : Self-heating; may catch fire.

|                            |                                                                                      |
|----------------------------|--------------------------------------------------------------------------------------|
| Precautionary statement(s) |                                                                                      |
| P210                       | Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.                  |
| P235 + P410                | Keep cool. Protect from sunlight.                                                    |
| P240                       | Ground/bond container and receiving equipment.                                       |
| P241                       | Use explosion-proof electrical/ ventilating/ lighting/ equipment.                    |
| P280                       | Wear protective gloves/ eye protection/ face protection.                             |
| 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.                                         |
| P407                       | Maintain air gap between stacks/ pallets.                                            |
| P420                       | Store away from other materials.                                                     |

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

---

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

|                  |               |
|------------------|---------------|
| Formula          | : Fe          |
| Molecular weight | : 55.85 g/mol |
| CAS-No.          | : 7439-89-6   |
| EC-No.           | : 231-096-4   |

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

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.

#### In case of eye contact

After eye contact: rinse out with plenty of water. Remove contact lenses.

#### If swallowed

After swallowing: make victim drink water (two glasses at most). Consult doctor if feeling unwell.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

## **SECTION 5: Firefighting measures**

### **5.1 Extinguishing media**

#### **Suitable extinguishing media**

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

#### **Unsuitable extinguishing media**

For this substance/mixture no limitations of extinguishing agents are given.

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

Iron oxides

Not combustible.

Ambient fire may liberate hazardous vapours.

### **5.3 Advice for firefighters**

In the event of fire, wear self-contained breathing apparatus.

### **5.4 Further information**

Suppress (knock down) gases/vapors/mists with a water spray jet.

---

## **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. 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. Risk of explosion.

### **6.3 Methods and materials for containment and cleaning up**

Observe possible material restrictions (see sections 7 and 10). Take up dry. 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 protection against fire and explosion**

Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharge.

#### **Hygiene measures**

Change contaminated clothing. Wash hands after working with substance.  
For precautions see section 2.2.

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

#### **Storage conditions**

Tightly closed. Keep away from heat and sources of ignition.

#### **Storage stability**

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Recommended storage temperature  
2 - 8 °C

**Storage class**

Storage class (TRGS 510): 4.2: Pyrophoric and self-heating hazardous materials

**7.3 Specific end use(s)**

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

---

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

**8.1 Control parameters**

**Ingredients with workplace control parameters**

Contains no substances with occupational exposure limit values.

**8.2 Exposure controls**

**Appropriate engineering controls**

Change contaminated clothing. Wash hands after working with substance.

**Personal protective equipment**

**Eye/face protection**

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

**Body Protection**

Flame retardant antistatic 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. Risk of explosion.

---

**SECTION 9: Physical and chemical properties**

**9.1 Information on basic physical and chemical properties**

- |                                            |                                                       |
|--------------------------------------------|-------------------------------------------------------|
| a) Appearance                              | Form: powder<br>Color: light gray                     |
| b) Odor                                    | odorless                                              |
| c) Odor Threshold                          | Not applicable                                        |
| d) pH                                      | Not applicable                                        |
| e) Melting point/freezing point            | Melting point/range: 1,538 °C (2,800 °F) at 1,023 hPa |
| f) Initial boiling point and boiling range | 2,861 °C 5,182 °F at 1,013 hPa                        |
| g) Flash point                             | ( )Not applicable                                     |

|    |                                              |                                                                             |
|----|----------------------------------------------|-----------------------------------------------------------------------------|
| 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                               | Not applicable                                                              |
| l) | Vapor density                                | No data available                                                           |
| m) | Density                                      | No data available                                                           |
|    | Relative density                             | 7.8720 °C                                                                   |
| n) | Water solubility                             | insoluble                                                                   |
| o) | Partition coefficient: n-octanol/water       | Not applicable for inorganic substances                                     |
| p) | Autoignition temperature                     | The substance or mixture is classified as self heating with the category 1. |
| q) | Decomposition temperature                    | No data available                                                           |
| r) | Viscosity                                    | No data available                                                           |
| s) | Explosive properties                         | No data available                                                           |
| t) | Oxidizing properties                         | The substance or mixture is not classified as oxidizing.                    |

## 9.2 Other safety information

Dust explosion class St1

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

Self-heating; may catch fire.

### 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 acids

### 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 - 7,500 mg/kg

Remarks: (Lit.)

Inhalation: No data available

Dermal: No data available

#### Skin corrosion/irritation

No skin irritation

#### Serious eye damage/eye irritation

Eyes - Rabbit

Result: No eye irritation

(OECD Test Guideline 405)

Remarks: (Lit.)

#### Respiratory or skin sensitization

Did not cause sensitization on laboratory animals.

#### Germ cell mutagenicity

Test system: *S. typhimurium*

Method: OECD Test Guideline 471

Result: Not mutagenic in Ames Test.

Remarks: (Lit.)

#### 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

Did not show teratogenic effects in animal experiments.

Animal testing did not show any effects on fertility.

#### Specific target organ toxicity - single exposure

The substance or mixture is not classified as specific target organ toxicant, single exposure.

#### Specific target organ toxicity - repeated exposure

The substance or mixture is not classified as specific target organ toxicant, repeated exposure.

#### Aspiration hazard

No data available

### 11.2 Additional Information

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

---

## SECTION 12: Ecological information

### 12.1 Toxicity

Aldrich - 12310

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Toxicity to fish                      static test - Morone saxatilis - 13.6 mg/l - 96 h

## **12.2 Persistence and degradability**

Not applicable

## **12.3 Bioaccumulative potential**

No data available

## **12.4 Mobility in soil**

No data available

## **12.5 Results of PBT and vPvB assessment**

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

## **12.6 Endocrine disrupting properties**

No data available

## **12.7 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.

---

## **SECTION 14: Transport information**

### **DOT (US)**

UN number: 3178    Class: 4.1                      Packing group: III  
Proper shipping name: Flammable solid, inorganic, n.o.s. (Iron Powder,)  
Reportable Quantity (RQ):  
Poison Inhalation Hazard: No

### **IMDG**

UN number: 3178    Class: 4.1                      Packing group: III                      EMS-No: F-A, S-G  
Proper shipping name: FLAMMABLE SOLID, INORGANIC, N.O.S. (Iron Powder,)

### **IATA**

UN number: 3178    Class: 4.1                      Packing group: III  
Proper shipping name: Flammable solid, inorganic, n.o.s. (Iron Powder,)

---

## **SECTION 15: Regulatory information**

### **SARA 302 Components**

This material does not contain any components with a section 302 EHS TPQ.

### **SARA 313 Components**

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

**SARA 311/312 Hazards**

No SARA Hazards

**Massachusetts Right To Know Components**

No components are subject to the Massachusetts Right to Know Act.

---

**SECTION 16: Other information****Further information**

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](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: 09/27/2022

Print Date: 08/12/2023

## SAFETY DATA SHEET

Version 6.8  
Revision Date 02/07/2023  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Lead

Product Number : 391352  
Brand : Aldrich  
Index-No. : 082-013-00-1  
CAS-No. : 7439-92-1

**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)**

Carcinogenicity (Category 2), H351  
Reproductive toxicity (Category 1A), H360  
Effects on or via lactation, H362  
Specific target organ toxicity - repeated exposure, Oral (Category 1), Central nervous system, Blood, Immune system, Kidney, 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)

H351 Suspected of causing cancer.  
H360 May damage fertility or the unborn child.  
H362 May cause harm to breast-fed children.  
H372 Causes damage to organs (Central nervous system, Blood, Immune system, Kidney) 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.  
P263 Avoid contact during pregnancy/ while nursing.  
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.  
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

Formula : Pb  
Molecular weight : 207.20 g/mol  
CAS-No. : 7439-92-1  
EC-No. : 231-100-4  
Index-No. : 082-013-00-1

| Component   | Classification                                                                                                                                                                                                           | Concentration |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>Lead</b> |                                                                                                                                                                                                                          |               |
|             | Carc. 2; Repr. 1A; Lact. ; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H351, H360, H362, H372, H400, H410<br>Concentration limits:<br>>= 2.5 %: Repr. 2, H361f; >= 0.5 %: STOT RE 2, H373; >= 0.03 %: Repr. 1A, H360; | <= 100 %      |

|  |                                                      |  |
|--|------------------------------------------------------|--|
|  | M-Factor - Aquatic Acute:<br>1 - Aquatic Chronic: 10 |  |
|--|------------------------------------------------------|--|

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**

After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

#### **Suitable extinguishing media**

Water Foam Carbon dioxide (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

Nature of decomposition products not known.

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.



---

## 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

No special precautionary measures necessary.

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

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                                   |
|-----------|-----------|--------------------------------------------------------------|------------------------|-----------------------------------------|
|           | Remarks   | See 1910.1025                                                |                        |                                         |
| Lead      | 7439-92-1 | TWA                                                          | 0.05 mg/m <sup>3</sup> | USA. ACGIH Threshold Limit Values (TLV) |
|           |           | Confirmed animal carcinogen with unknown relevance to humans |                        |                                         |

|  |  |                                                                                                                                                                                                                                                             |                        |                                         |
|--|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-----------------------------------------|
|  |  | TWA                                                                                                                                                                                                                                                         | 0.05 mg/m <sup>3</sup> | USA. ACGIH Threshold Limit Values (TLV) |
|  |  | Central Nervous System impairment<br>Hematologic effects<br>Peripheral Nervous System impairment<br>Substances for which there is a Biological Exposure Index or Indices (see BEI® section)<br>Confirmed animal carcinogen with unknown relevance to humans |                        |                                         |
|  |  | TWA                                                                                                                                                                                                                                                         | 0.05 mg/m <sup>3</sup> | USA. NIOSH Recommended Exposure Limits  |
|  |  | See Appendix C                                                                                                                                                                                                                                              |                        |                                         |

#### Biological occupational exposure limits

| Component | CAS-No.   | Parameters   | Value    | Biological specimen | Basis                                     |
|-----------|-----------|--------------|----------|---------------------|-------------------------------------------|
| Lead      | 7439-92-1 | Lead         | 200 µg/l | In blood            | ACGIH - Biological Exposure Indices (BEI) |
|           | Remarks   | Not critical |          |                     |                                           |

## 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: 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**

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**

No special precautionary measures necessary.

---

## **SECTION 9: Physical and chemical properties**

### **9.1 Information on basic physical and chemical properties**

|                                                 |                                                                                     |
|-------------------------------------------------|-------------------------------------------------------------------------------------|
| a) Appearance                                   | Form: powder                                                                        |
| b) Odor                                         | No data available                                                                   |
| c) Odor Threshold                               | No data available                                                                   |
| d) pH                                           | No data available                                                                   |
| e) Melting point/freezing point                 | Melting point/range: 327.4 °C (621.3 °F) - lit.                                     |
| f) Initial boiling point and boiling range      | 1,740 °C 3,164 °F - lit.                                                            |
| g) Flash point                                  | ( )Not applicable                                                                   |
| h) Evaporation rate                             | No data available                                                                   |
| i) Flammability (solid, gas)                    | No data available                                                                   |
| j) Upper/lower flammability or explosive limits | No data available                                                                   |
| k) Vapor pressure                               | No data available                                                                   |
| l) Vapor density                                | No data available                                                                   |
| m) Density                                      | 11.45 g/cm <sup>3</sup> at 23.8 °C (74.8 °F) at 1,013 hPa - OECD Test Guideline 109 |
|                                                 | Relative density 11.4523.8 °C - OECD Test Guideline 109                             |
| n) Water solubility                             | 0.185 g/l at 20 °C (68 °F) at 1,013 hPa - OECD Test Guideline 105 - partly soluble  |
| o) Partition coefficient: n-octanol/water       | Not applicable for inorganic substances                                             |
| p) Autoignition temperature                     | No data available                                                                   |
| q) Decomposition temperature                    | No data available                                                                   |

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- r) Viscosity No data available
- s) Explosive properties No data available
- t) Oxidizing properties none

## **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**

Risk of explosion with:

azides

picrates

ammonium nitrate

Strong oxidizing agents

Exothermic reaction with:

Fluorine

hydrogen peroxide

Generates dangerous gases or fumes in contact with:

Nitric acid

### **10.4 Conditions to avoid**

no information available

### **10.5 Incompatible materials**

No data available

### **10.6 Hazardous decomposition products**

In the event of fire: see section 5

---

## **SECTION 11: Toxicological information**

### **11.1 Information on toxicological effects**

#### **Acute toxicity**

LD50 Oral - Rat - male and female - > 2,000 mg/kg  
(OECD Test Guideline 423)

LC50 Inhalation - Rat - male and female - 4 h - > 5.05 mg/l - dust/mist

(OECD Test Guideline 403)  
LD50 Dermal - Rat - male and female - > 2,000 mg/kg  
(OECD Test Guideline 402)

#### **Skin corrosion/irritation**

Skin - Rabbit

Result: No skin irritation - 4 h  
(OECD Test Guideline 404)

#### **Serious eye damage/eye irritation**

Eyes - Rabbit

Result: No eye irritation - 72 h  
(OECD Test Guideline 405)

#### **Respiratory or skin sensitization**

Maximization Test - Guinea pig

Result: negative  
(OECD Test Guideline 406)

#### **Germ cell mutagenicity**

Test Type: Micronucleus test

Species: Rat

Cell type: Red blood cells (erythrocytes)

Application Route: Oral

Result: positive  
Remarks: (ECHA)

Test Type: comet assay

Species: Mouse

Cell type: Liver cells

Application Route: Inhalation

Result: negative  
Remarks: (ECHA)

Test Type: Micronucleus test

Species: Mouse

Cell type: Bone marrow

Application Route: Oral

Result: Positive results were obtained in some in vivo tests.  
Remarks: (ECHA)

Test Type: Chromosome aberration test in vitro

Species: Monkey

Cell type: lymphocyte

Application Route: Oral

Result: Positive results were obtained in some in vivo tests.  
Remarks: (ECHA)

#### **Carcinogenicity**

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Lead)

NTP: RAHC - Reasonably anticipated to be a human carcinogenThe reference note has

been added by TD based on the background information of the NTP. (Lead)

OSHA: OSHA specifically regulated carcinogen (Lead)

#### **Reproductive toxicity**

May damage the unborn child. Positive evidence from human epidemiological studies. May damage fertility. Positive evidence from human epidemiological studies. 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**

Oral - Causes damage to organs through prolonged or repeated exposure.

- Central nervous system, Blood, Immune system, Kidney

#### **Aspiration hazard**

No data available

### **11.2 Additional Information**

RTECS: OF7525000

anemia

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

On the basis of the morphology of the product, no hazardous properties are to be expected when it is handled and used with appropriate care.

The following applies to lead compounds in general: Due to the poor absorbability via the gastrointestinal tract, only very high doses lead to acute cases of intoxication. After a latency period of several hours, metallic taste, nausea, vomiting, and colics occur, in many instances followed by shock. Chronic uptake causes peripheral muscular weakness ("drop-wrist"), anaemia, and central-nervous disorders. Women of child-bearing age should not be exposed to the substance over longer periods of time (observe critical threshold).

Handle in accordance with good industrial hygiene and safety practice.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

---

## **SECTION 12: Ecological information**

### **12.1 Toxicity**

|                   |                                                                                                  |
|-------------------|--------------------------------------------------------------------------------------------------|
| Toxicity to fish  | static test LC50 - Oncorhynchus mykiss (rainbow trout) - 0.1 mg/l - 96 h<br>Remarks: (ECHA)      |
| Toxicity to algae | mortality EC50 - Skeletonema costatum - 7.94 mg/l - 10 d<br>Remarks: (ECOTOX Database)<br>(Lead) |
| Toxicity to       | flow-through test NOEC - Cyprinodon variegatus (sheepshead)                                      |

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fish(Chronic toxicity) minnow) - 0.23 mg/l - 28 d  
Remarks: (ECHA)

## 12.2 Persistence and degradability

Biodegradability Result: - According to the results of tests of biodegradability this product is not readily biodegradable.  
Remarks: The methods for determining biodegradability are not applicable to inorganic substances.

## 12.3 Bioaccumulative potential

Bioaccumulation Oncorhynchus kisutch - 2 Weeks  
- 150 µg/l(Lead)

Bioconcentration factor (BCF): 12

## 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 Endocrine disrupting properties

No data available

## 12.7 Other adverse effects

Discharge into the environment must be avoided.

---

## SECTION 13: Disposal considerations

### 13.1 Waste treatment methods

#### Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See [www.retrologistik.com](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: 3077 Class: 9 Packing group: III  
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Lead)  
Reportable Quantity (RQ): 10 lbs  
Reportable Quantity (RQ): 10 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. (Lead)  
Marine pollutant : yes  
Marine pollutant : no

**IATA**

UN number: 3077 Class: 9

Packing group: III

Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Lead)

**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**

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 |
|------|-----------|---------------|
| Lead | 7439-92-1 | 2015-11-23    |

**SARA 311/312 Hazards**

Acute Health Hazard, Chronic Health Hazard

:

**Reportable Quantity** D008 lbs

**Massachusetts Right To Know Components**

|      | CAS-No.   | Revision Date |
|------|-----------|---------------|
| Lead | 7439-92-1 | 2015-11-23    |

**Pennsylvania Right To Know Components**

|      | CAS-No.   | Revision Date |
|------|-----------|---------------|
| Lead | 7439-92-1 | 2015-11-23    |

**California Prop. 65 Components**

, which is/are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).Lead

| CAS-No.   | Revision Date |
|-----------|---------------|
| 7439-92-1 | 2009-02-01    |



---

## 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: 6.8

Revision Date: 02/07/2023

Print Date: 10/07/2023

## SAFETY DATA SHEET

Version 6.5  
Revision Date 04/04/2022  
Print Date 08/12/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Manganese

Product Number : 266167  
Brand : Aldrich  
CAS-No. : 7439-96-5

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

Company : Sigma-Aldrich 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)**

Short-term (acute) aquatic hazard (Category 2), H401

For the full text of the H-Statements mentioned in this Section, see Section 16.

**2.2 GHS Label elements, including precautionary statements**

Pictogram none

Signal word none

Hazard statement(s)  
H401 Toxic to aquatic life.

Precautionary statement(s)  
P273 Avoid release to the environment.  
P501 Dispose of contents/ container to an approved waste disposal

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plant.

## 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

---

### SECTION 3: Composition/information on ingredients

#### 3.1 Substances

Formula : Mn  
Molecular weight : 54.94 g/mol  
CAS-No. : 7439-96-5  
EC-No. : 231-105-1

| Component                                             | Classification        | Concentration |
|-------------------------------------------------------|-----------------------|---------------|
| <b>manganese, metallic flakes / coarsely powdered</b> |                       |               |
|                                                       | Aquatic Acute 2; 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

Wash off with soap and plenty of water. Consult a physician.

##### In case of eye contact

Flush eyes with water as a precaution.

##### If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

### SECTION 5: Firefighting measures

#### 5.1 Extinguishing media

##### Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

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

Manganese/manganese 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. Ensure adequate ventilation. For personal protection see section 8.

### **6.2 Environmental precautions**

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

### **6.3 Methods and materials for containment and cleaning up**

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

### **6.4 Reference to other sections**

For disposal see section 13.

---

## **SECTION 7: Handling and storage**

### **7.1 Precautions for safe handling**

#### **Advice on safe handling**

Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

#### **Advice on protection against fire and explosion**

Provide appropriate exhaust ventilation at places where dust is formed.

#### **Hygiene measures**

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.  
For precautions see section 2.2.

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

#### **Storage conditions**

Keep container tightly closed in a dry and well-ventilated place.

Moisture sensitive. Handle and store under inert gas.

#### **Storage class**

Storage class (TRGS 510): 13: Non Combustible Solids

### **7.3 Specific end use(s)**

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

## SECTION 8: Exposure controls/personal protection

### 8.1 Control parameters

#### Ingredients with workplace control parameters

| Component                                      | CAS-No.   | Value                                                              | Control parameters     | Basis                                                                                   |
|------------------------------------------------|-----------|--------------------------------------------------------------------|------------------------|-----------------------------------------------------------------------------------------|
| manganese, metallic flakes / coarsely powdered | 7439-96-5 | C                                                                  | 5 mg/m <sup>3</sup>    | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|                                                | Remarks   | Ceiling limit is to be determined from breathing-zone air samples. |                        |                                                                                         |
|                                                |           | TWA                                                                | 1 mg/m <sup>3</sup>    | USA. NIOSH Recommended Exposure Limits                                                  |
|                                                |           | ST                                                                 | 3 mg/m <sup>3</sup>    | USA. NIOSH Recommended Exposure Limits                                                  |
|                                                |           | C                                                                  | 5 mg/m <sup>3</sup>    | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|                                                |           | PEL                                                                | 0.2 mg/m <sup>3</sup>  | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|                                                |           | STEL                                                               | 3 mg/m <sup>3</sup>    | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|                                                |           | TWA                                                                | 1 mg/m <sup>3</sup>    | USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000                           |
|                                                |           | STEL                                                               | 3 mg/m <sup>3</sup>    | USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000                           |
|                                                |           | TWA                                                                | 0.1 mg/m <sup>3</sup>  | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|                                                |           | Not classifiable as a human carcinogen                             |                        |                                                                                         |
|                                                |           | TWA                                                                | 0.02 mg/m <sup>3</sup> | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|                                                |           | Not classifiable as a human carcinogen                             |                        |                                                                                         |

### 8.2 Exposure controls

#### Appropriate engineering controls

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

#### Personal protective equipment

##### Eye/face protection

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

**Skin protection**

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

**Body Protection**

Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

**Respiratory protection**

Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

**Control of environmental exposure**

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

---

**SECTION 9: Physical and chemical properties****9.1 Information on basic physical and chemical properties**

- |                                                 |                                                 |
|-------------------------------------------------|-------------------------------------------------|
| a) Appearance                                   | Form: chips<br>Color: gray, brown, silver       |
| b) Odor                                         | odorless                                        |
| c) Odor Threshold                               | No data available                               |
| d) pH                                           | No data available                               |
| e) Melting point/freezing point                 | Melting point/range: 1,244 °C (2,271 °F) - lit. |
| f) Initial boiling point and boiling range      | 1,962 °C 3,564 °F - lit.                        |
| g) Flash point                                  | ( )Not applicable                               |
| h) Evaporation rate                             | No data available                               |
| i) Flammability (solid, gas)                    | No data available                               |
| j) Upper/lower flammability or explosive limits | No data available                               |
| k) Vapor pressure                               | No data available                               |
| l) Vapor density                                | No data available                               |
| m) Density                                      | 7.3 g/mL at 25 °C (77 °F) - lit.                |
| Relative density                                | No data available                               |
| n) Water solubility                             | 0.0007 g/l at 20 °C (68 °F)                     |
| o) Partition coefficient: n-octanol/water       | Not applicable for inorganic substances         |

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

## 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

Avoid moisture.

### 10.5 Incompatible materials

acids, Halogens, Bases, Phosphorus, Sulfur oxides, Hydrogen peroxide, Oxidizing agents, Nitric acid, Sodium Hydroxide, Carbon dioxide (CO<sub>2</sub>), Nitryl Flouride, Steam

### 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 - female - > 2,000 mg/kg  
(OECD Test Guideline 420)

LC50 Inhalation - Rat - male and female - 4 h - > 5.14 mg/l

(OECD Test Guideline 403)

Dermal: No data available

No data available

#### Skin corrosion/irritation

Skin - Rabbit

Result: No skin irritation

(OECD Test Guideline 404)

#### Serious eye damage/eye irritation

Eyes - Rabbit

Result: No eye irritation - 72 h

(OECD Test Guideline 405)

#### **Respiratory or skin sensitization**

- Mouse

Result: Does not cause skin sensitization.

(OECD Test Guideline 429)

#### **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**

Overexposure may cause reproductive disorder(s) based on tests with laboratory animals.

#### **Specific target organ toxicity - single exposure**

No data available

#### **Specific target organ toxicity - repeated exposure**

No data available

#### **Aspiration hazard**

No data available

### **11.2 Additional Information**

Men exposed to manganese dusts showed a decrease in fertility. Chronic manganese poisoning primarily involves the central nervous system. Early symptoms include languor, sleepiness and weakness in the legs. A stolid mask-like appearance of the face, emotional disturbances such as uncontrollable laughter and a spastic gait with tendency to fall in walking are findings in more advanced cases. High incidence of pneumonia has been found in workers exposed to the dust or fume of some manganese compounds., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

---

## **SECTION 12: Ecological information**

### **12.1 Toxicity**

|                  |                                                                                                                                                                |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Toxicity to fish | semi-static test NOEC - Oncorhynchus mykiss (rainbow trout) - 3.6 mg/l - 96 h<br>(OECD Test Guideline 203)<br>Remarks: No toxicity at the limit of solubility. |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                       |                                                                    |
|---------------------------------------|--------------------------------------------------------------------|
| Toxicity to daphnia and other aquatic | Immobilization NOEC - Daphnia magna (Water flea) - 1.6 mg/l - 48 h |
|---------------------------------------|--------------------------------------------------------------------|

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|                      |                                                                                                                      |
|----------------------|----------------------------------------------------------------------------------------------------------------------|
| invertebrates        | (OECD Test Guideline 202)<br>Remarks: No toxicity at the limit of solubility.                                        |
| Toxicity to algae    | Growth inhibition EC50 - <i>Desmodesmus subspicatus</i> (green algae) - 4.5 mg/l - 72 h<br>(OECD Test Guideline 201) |
| Toxicity to bacteria | Respiration inhibition EC50 - Sludge Treatment - 1,000 mg/l - 3 h<br>(OECD Test Guideline 209)                       |

## 12.2 Persistence and degradability

The methods for determining biodegradability are not applicable to inorganic substances.

## 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 Endocrine disrupting properties

No data available

## 12.7 Other adverse effects

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

Toxic to aquatic life.

No data available

---

## SECTION 13: Disposal considerations

### 13.1 Waste treatment methods

#### Product

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

#### Contaminated packaging

Dispose of as unused product.

---

## SECTION 14: Transport information

### DOT (US)

Not dangerous goods

### IMDG

Not dangerous goods

### IATA

Not dangerous goods

### Further information

Not classified as dangerous in the meaning of transport regulations.

---

## SECTION 15: Regulatory information

### SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

### SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

|                                                | CAS-No.   | Revision Date |
|------------------------------------------------|-----------|---------------|
| manganese, metallic flakes / coarsely powdered | 7439-96-5 | 2007-07-01    |

### SARA 311/312 Hazards

Chronic Health Hazard

### Massachusetts Right To Know Components

|                                                | CAS-No.   | Revision Date |
|------------------------------------------------|-----------|---------------|
| manganese, metallic flakes / coarsely powdered | 7439-96-5 | 2007-07-01    |

### Pennsylvania Right To Know Components

|                                                | CAS-No.   | Revision Date |
|------------------------------------------------|-----------|---------------|
| manganese, metallic flakes / coarsely powdered | 7439-96-5 | 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: 6.5

Revision Date: 04/04/2022

Print Date: 08/12/2023

## SAFETY DATA SHEET

Version 6.8  
Revision Date 02/07/2023  
Print Date 03/18/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Mercury

Product Number : 294594  
Brand : Aldrich  
Index-No. : 080-001-00-0  
CAS-No. : 7439-97-6

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

Identified uses : Scientific research and development, Reagent for analysis

**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, Inhalation (Category 2), H330  
Reproductive toxicity (Category 1B), H360  
Specific target organ toxicity - repeated exposure (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)        |                                                                                                                      |
| H330                       | Fatal if inhaled.                                                                                                    |
| H360                       | May damage fertility or the unborn child.                                                                            |
| H372                       | Causes 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.                                                                  |
| 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.                                        |
| P284                       | Wear respiratory protection.                                                                                         |
| P304 + P340 + P310         | IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor. |
| P308 + P313                | IF exposed or concerned: Get medical advice/ attention.                                                              |
| P391                       | Collect spillage.                                                                                                    |
| P403 + P233                | Store in a well-ventilated place. Keep container tightly closed.                                                     |
| P405                       | Store locked up.                                                                                                     |
| P501                       | Dispose of contents/ container to an approved waste disposal plant.                                                  |

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

|                  |                |
|------------------|----------------|
| Formula          | : Hg           |
| Molecular weight | : 200.59 g/mol |
| CAS-No.          | : 7439-97-6    |
| EC-No.           | : 231-106-7    |
| Index-No.        | : 080-001-00-0 |

| Component      | Classification                                                                                                                                                  | Concentration |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>mercury</b> |                                                                                                                                                                 |               |
|                | Acute Tox. 2; Repr. 1B;<br>STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1;<br>H330, H360, H372, H400, H410<br>M-Factor - Aquatic Acute: 1 - 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

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

Mercury/mercury oxides.  
Not 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 breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.  
For personal protection see section 8.

### 6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.  
Discharge into the environment must be avoided.

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

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

### 6.4 Reference to other sections

For disposal see section 13.

---

## SECTION 7: Handling and storage

### 7.1 Precautions for safe handling

#### Advice on safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapor or mist.

#### 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. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Store under inert gas.

#### 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                                                              |
|-----------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|--------------------------------------------------------------------|
| mercury   | 7439-97-6 | C                                                                                                                                             | 0.1 mg/m <sup>3</sup>   | USA. NIOSH Recommended Exposure Limits                             |
|           | Remarks   | Potential for dermal absorption                                                                                                               |                         |                                                                    |
|           |           | CEIL                                                                                                                                          | 1.0mg/10m <sup>3</sup>  | USA. Occupational Exposure Limits (OSHA) - Table Z-2               |
|           |           | TWA                                                                                                                                           | 0.05 mg/m <sup>3</sup>  | USA. Table Z-1-A Limits for Air Contaminants (1989 vacated values) |
|           |           | Skin notation                                                                                                                                 |                         |                                                                    |
|           |           | TWA                                                                                                                                           | 0.025 mg/m <sup>3</sup> | USA. ACGIH Threshold Limit Values (TLV)                            |
|           |           | Central Nervous System impairment<br>Kidney damage<br>Substances for which there is a Biological Exposure Index or Indices (see BEI® section) |                         |                                                                    |

|  |  |                                                                          |            |                                        |
|--|--|--------------------------------------------------------------------------|------------|----------------------------------------|
|  |  | Not classifiable as a human carcinogen<br>Danger of cutaneous absorption |            |                                        |
|  |  | TWA                                                                      | 0.05 mg/m3 | USA. NIOSH Recommended Exposure Limits |
|  |  | Potential for dermal absorption                                          |            |                                        |

## 8.2 Exposure controls

### Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

### Personal protective equipment

#### Eye/face protection

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: 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

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

#### Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

### Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.  
Discharge into the environment must be avoided.

---

## SECTION 9: Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

|                                                 |                                                        |
|-------------------------------------------------|--------------------------------------------------------|
| a) Appearance                                   | Form: liquid<br>Color: silver, white                   |
| b) Odor                                         | odorless                                               |
| c) Odor Threshold                               | No data available                                      |
| d) pH                                           | No data available                                      |
| e) Melting point/freezing point                 | Melting point/range: -38.87 °C (-37.97 °F) - lit.      |
| f) Initial boiling point and boiling range      | 356.6 °C 673.9 °F - lit.                               |
| g) Flash point                                  | ( )Not applicable                                      |
| h) Evaporation rate                             | No data available                                      |
| i) Flammability (solid, gas)                    | No data available                                      |
| j) Upper/lower flammability or explosive limits | No data available                                      |
| k) Vapor pressure                               | < 0.01 hPa at 20 °C (68 °F)<br>1 hPa at 126 °C(259 °F) |
| l) Vapor density                                | 6.93 - (Air = 1.0)                                     |
| m) Density                                      | 13.55 g/cm <sup>3</sup> at 25 °C (77 °F)               |
| Relative density                                | No data available                                      |
| n) Water solubility                             | 0.00006 g/l at 25 °C (77 °F)                           |
| 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

|                        |                    |
|------------------------|--------------------|
| Relative vapor density | 6.93 - (Air = 1.0) |
|------------------------|--------------------|



---

## 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, Ammonia, Azides, Nitrates, Chlorates, Copper

### 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

Oral: No data available

LC50 Inhalation - Rat - male - 2 h - < 27 mg/m<sup>3</sup> - vapor

Dermal: 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

Presumed human reproductive toxicant

#### Specific target organ toxicity - single exposure

No data available

Causes damage to organs through prolonged or repeated exposure.

No data available

## RTECS: OV4550000

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

Toxicity to fish      mortality LC50 - *Cyprinus carpio* (Carp) - 0.160 mg/l - 96 h

|                                    |                                      |
|------------------------------------|--------------------------------------|
| Toxicity to fish(Chronic toxicity) | Remarks: No data available (mercury) |
|------------------------------------|--------------------------------------|

The methods for determining biodegradability are not applicable to inorganic substances.

Bioaccumulation      Carassius auratus (goldfish) - 1,789 d  
- 0.25 µg/l(mercury)

Bioconcentration factor (BCF): 155,986

No data available

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

No data available

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

## Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

**Contaminated packaging**

Dispose of as unused product.

---

**SECTION 14: Transport information****DOT (US)**

UN number: 2809 Class: 8 (6.1) Packing group: III  
Proper shipping name: Mercury  
Reportable Quantity (RQ): 1 lbs  
Reportable Quantity (RQ): 1 lbs  
Poison Inhalation Hazard: No

**IMDG**

UN number: 2809 Class: 8 (6.1) Packing group: III EMS-No: F-A, S-B  
Proper shipping name: MERCURY  
Marine pollutant : yes

**IATA**

UN number: 2809 Class: 8 (6.1) Packing group: III  
Proper shipping name: Mercury

---

**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 |
|---------|-----------|---------------|
| mercury | 7439-97-6 | 2015-11-23    |

**SARA 311/312 Hazards**

Acute Health Hazard, Chronic Health Hazard

:  
**Reportable Quantity** D009 lbs

**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 |
|---------|-----------|---------------|
| mercury | 7439-97-6 | 2015-11-23    |

**California Prop. 65 Components**

|                                                                                                                                                                                                                  | CAS-No.   | Revision Date |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---------------|
| , which is/are known to the State of California to cause birth defects or other reproductive harm. For more information go to <a href="http://www.P65Warnings.ca.gov/mercury">www.P65Warnings.ca.gov/mercury</a> | 7439-97-6 | 2013-12-20    |

---

## 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: 6.8

Revision Date: 02/07/2023

Print Date: 03/18/2023

## SAFETY DATA SHEET

Version 6.15  
Revision Date 08/09/2023  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Dichloromethane

Product Number : 270997  
Brand : Sigma-Aldrich  
Index-No. : 602-004-00-3  
CAS-No. : 75-09-2

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

Identified uses : Laboratory chemicals, Synthesis of substances

Uses advised against : This chemical/product is not and cannot be distributed in commerce (as defined in TSCA section 3(5)) or processed (as defined in TSCA section 3(13)) for consumer paint or coating removal.

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

Company : Sigma-Aldrich Inc.  
3050 SPRUCE ST  
ST. LOUIS MO 63103  
UNITED STATES

Telephone : +1 314 771-5765  
Fax : +1 800 325-5052

**1.4 Emergency telephone**

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

**SECTION 2: Hazards identification****2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Skin irritation (Category 2), H315  
Eye irritation (Category 2A), H319  
Carcinogenicity (Category 2), H351  
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336

For the full text of the H-Statements mentioned in this Section, see Section 16.

## 2.2 GHS Label elements, including precautionary statements

Pictogram



Signal Word

Warning

Hazard statement(s)

H315

Causes skin irritation.

H319

Causes serious eye irritation.

H336

May cause drowsiness or dizziness.

H351

Suspected of causing cancer.

Precautionary statement(s)

P201

Obtain special instructions before use.

P202

Do not handle until all safety precautions have been read and understood.

P261

Avoid breathing mist or vapors.

P264

Wash skin thoroughly after handling.

P271

Use only outdoors or in a well-ventilated area.

P280

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

P302 + P352

IF ON SKIN: Wash with plenty of soap and water.

P304 + P340 + P312

IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.

P305 + P351 + P338

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

P308 + P313

IF exposed or concerned: Get medical advice/ attention.

P332 + P313

If skin irritation occurs: Get medical advice/ attention.

P337 + P313

If eye irritation persists: Get medical advice/ attention.

P362

Take off contaminated clothing and wash before reuse.

P403 + P233

Store in a well-ventilated place. Keep container tightly closed.

P405

Store locked up.

P501

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

## 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

### SECTION 3: Composition/information on ingredients

#### 3.1 Substances

Synonyms : Methylene chloride  
DCM

Formula :  $\text{CH}_2\text{Cl}_2$

Molecular weight : 84.93 g/mol

CAS-No. : 75-09-2

EC-No. : 200-838-9

Index-No. : 602-004-00-3

| Component | Classification | Concentration |
|-----------|----------------|---------------|
|-----------|----------------|---------------|

|                        |                                                                                                                                   |          |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>Dichloromethane</b> |                                                                                                                                   |          |
|                        | Skin Irrit. 2; Eye Irrit. 2A;<br>Carc. 2; STOT SE 3; H315,<br>H319, H351, H336<br>Concentration limits:<br>20 %: STOT SE 3, H336; | <= 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

After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

#### Suitable extinguishing media

Water Foam Carbon dioxide (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: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.

For personal protection see section 8.

### 6.2 Environmental precautions

Do not let product enter drains.

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

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

### 6.4 Reference to other sections

For disposal see section 13.

---

## SECTION 7: Handling and storage

### 7.1 Precautions for safe handling

#### Advice on safe handling

Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

#### 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.

Heat sensitive. Handle and store under inert gas.

#### Storage class

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

| Component       | CAS-No. | Value                                                        | Control parameters               | Basis                                                                                   |
|-----------------|---------|--------------------------------------------------------------|----------------------------------|-----------------------------------------------------------------------------------------|
| Dichloromethane | 75-09-2 | TWA                                                          | 50 ppm                           | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|                 | Remarks | Confirmed animal carcinogen with unknown relevance to humans |                                  |                                                                                         |
|                 |         | Potential Occupational Carcinogen                            |                                  |                                                                                         |
|                 |         | PEL                                                          | 25 ppm                           | OSHA Specifically Regulated Chemicals/Carcinogens                                       |
|                 |         | OSHA specifically regulated carcinogen                       |                                  |                                                                                         |
|                 |         | STEL                                                         | 125 ppm                          | OSHA Specifically Regulated Chemicals/Carcinogens                                       |
|                 |         | OSHA specifically regulated carcinogen                       |                                  |                                                                                         |
|                 |         | PEL                                                          | 25 ppm<br>87 mg/m <sup>3</sup>   | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|                 |         | STEL                                                         | 125 ppm<br>435 mg/m <sup>3</sup> | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |

#### Biological occupational exposure limits

| Component       | CAS-No. | Parameters                                               | Value    | Biological specimen | Basis                                     |
|-----------------|---------|----------------------------------------------------------|----------|---------------------|-------------------------------------------|
| Dichloromethane | 75-09-2 | Dichloromethane                                          | 0.3 mg/l | Urine               | ACGIH - Biological Exposure Indices (BEI) |
|                 | Remarks | End of shift (As soon as possible after exposure ceases) |          |                     |                                           |

#### Derived No Effect Level (DNEL)

| Application Area | Routes of exposure | Health effect              | Value                  |
|------------------|--------------------|----------------------------|------------------------|
| Workers          | Inhalation         | Acute systemic effects     | 706 mg/m <sup>3</sup>  |
| Workers          | Inhalation         | Long-term systemic effects | 353 mg/m <sup>3</sup>  |
| Workers          | Skin contact       | Long-term systemic effects | 4750mg/kg BW/d         |
| Consumers        | Ingestion          | Long-term systemic effects | 0.06mg/kg BW/d         |
| Consumers        | Inhalation         | Long-term systemic effects | 88.3 mg/m <sup>3</sup> |
| Consumers        | Skin contact       | Long-term systemic effects | 2395mg/kg BW/d         |
| Consumers        | Inhalation         | Acute systemic effects     | 353 mg/m <sup>3</sup>  |

#### Predicted No Effect Concentration (PNEC)

| Compartment | Value       |
|-------------|-------------|
| Soil        | 0.583 mg/kg |
| Sea water   | 0.194 mg/l  |
| Fresh water | 0.54 mg/l   |

|                               |            |
|-------------------------------|------------|
| Sea sediment                  | 1.61 mg/kg |
| Fresh water sediment          | 4.47 mg/kg |
| Onsite sewage treatment plant | 26 mg/l    |
| Aquatic intermittent release  | 0.27 mg/l  |

## 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

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: Viton®

Minimum layer thickness: 0.7 mm

Break through time: 120 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

#### Body Protection

protective clothing

#### Respiratory protection

Recommended Filter type: Filter AX (EN 371)

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer.

These measures have to be properly documented.

required when vapours/aerosols are generated.

#### 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      |
| b) Odor                         | ether-like                            |
| c) Odor Threshold               | 250 ppm                               |
| d) pH                           | No data available                     |
| e) Melting point/freezing point | Melting point/range: -97 °C (-143 °F) |

|                                                 |                                                                   |
|-------------------------------------------------|-------------------------------------------------------------------|
| f) Initial boiling point and boiling range      | 39.8 - 40 °C 103.6 - 104 °F                                       |
| g) Flash point                                  | ( )does not flash                                                 |
| h) Evaporation rate                             | 0.71                                                              |
| i) Flammability (solid, gas)                    | No data available                                                 |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 22 %(V)<br>Lower explosion limit: 13 %(V)  |
| k) Vapor pressure                               | 584 hPa at 25 °C (77 °F)                                          |
| l) Vapor density                                | 2.93                                                              |
| m) Density                                      | 1.325 g/mL at 25 °C (77 °F)                                       |
| Relative density                                | No data available                                                 |
| n) Water solubility                             | 13.2 g/l at 25 °C (77 °F)                                         |
| o) Partition coefficient: n-octanol/water       | log Pow: 1.25 at 20 °C (68 °F) - Bioaccumulation is not expected. |
| p) Autoignition temperature                     | 605 °C (1121 °F) at 1,013 hPa - DIN 51794                         |
| q) Decomposition temperature                    | No data available                                                 |
| r) Viscosity                                    | No data available                                                 |
| s) Explosive properties                         | No data available                                                 |
| t) Oxidizing properties                         | none                                                              |

## 9.2 Other safety information

|                        |      |
|------------------------|------|
| Relative vapor density | 2.93 |
|------------------------|------|

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

Sensitivity to light

The product is chemically stable under standard ambient conditions (room temperature) .

Contains the following stabilizer(s):

2-methyl-2-butene (>0.005 - <0.015 %)

### 10.3 Possibility of hazardous reactions

Risk of explosion with:

Alkali metals

nitrogen oxides

nitrogen dioxide

Potassium  
sodium azide  
perchloric acid  
Nitric acid  
aluminium chloride  
Amines  
Oxygen  
(as liquefied gas)  
powdered aluminium  
sodium  
aromatic hydrocarbons  
with  
powdered aluminium  
Exothermic reaction with:  
Alkaline earth metals  
Powdered metals  
amides  
alcoholates  
nonmetallic oxides  
potassium tert-butanolate  
sodium amide  
Lithium

#### **10.4 Conditions to avoid**

no information available

#### **10.5 Incompatible materials**

No data available

#### **10.6 Hazardous decomposition products**

In the event of fire: see section 5

---

### **SECTION 11: Toxicological information**

#### **11.1 Information on toxicological effects**

##### **Acute toxicity**

Acute toxicity estimate Oral - 2,500 mg/kg

(Calculation method)

LD50 Oral - Rat - male and female - > 2,000 mg/kg

(OECD Test Guideline 401)

LC50 Inhalation - Mouse - 4 h - 86 mg/l - vapor

Remarks: (ECHA)

Symptoms: Possible damages:, mucosal irritations

Acute toxicity estimate Dermal - 2,500 mg/kg

(Calculation method)

LD50 Dermal - Rat - male and female - > 2,000 mg/kg

(OECD Test Guideline 402)

##### **Skin corrosion/irritation**

Skin - Rabbit

Result: Irritations - 4 h

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(OECD Test Guideline 404)

Remarks: Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.

#### **Serious eye damage/eye irritation**

Eyes - Rabbit

Result: Eye irritation

Remarks: (ECHA)

Remarks: Risk of corneal clouding.

#### **Respiratory or skin sensitization**

Local lymph node assay (LLNA) - Mouse

Result: negative

(OECD Test Guideline 429)

#### **Germ cell mutagenicity**

Test Type: Mutagenicity (mammal cell test): chromosome aberration.

Test system: Chinese hamster ovary cells

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 473

Result: positive

Test Type: Ames test

Test system: Salmonella typhimurium

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 471

Result: positive

Test Type: In vivo micronucleus test

Species: Mouse

Cell type: Bone marrow

Application Route: Gavage

Method: OECD Test Guideline 474

Result: negative

#### **Carcinogenicity**

Suspected of causing cancer.

IARC: 2A - Group 2A: Probably carcinogenic to humans (Dichloromethane)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (Dichloromethane)

OSHA: OSHA specifically regulated carcinogen (Dichloromethane)

#### **Reproductive toxicity**

No data available

#### **Specific target organ toxicity - single exposure**

Inhalation - May cause drowsiness or dizziness. - Central nervous system

#### **Specific target organ toxicity - repeated exposure**

No data available

#### **Aspiration hazard**

No data available

### **11.2 Additional Information**

Repeated dose toxicity - Rat - male and female - Oral - 104 Weeks - NOAEL (No observed adverse effect level) - 6 mg/kg

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Repeated dose toxicity - Rat - male and female - Inhalation - 104 Weeks

RTECS: PA8050000

Dizziness, Nausea, Vomiting, narcosis, Cough, irritant effects, Unconsciousness, Shortness of breath, respiratory paralysis, somnolence, depressed respiration, CNS disorders, inebriation

Risk of corneal clouding.

The following applies to aliphatic halogenated hydrocarbons in general: systemic effect: narcosis, cardiovascular disorders. Toxic effect on liver, kidneys.

Dichloromethane is metabolized in the body producing carbon monoxide which increases and sustains carboxyhemoglobin levels in the blood, reducing the oxygen-carrying capacity of the blood.

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

Systemic effects:

After absorption of large quantities:

CNS disorders

Drowsiness

Dizziness

drop in blood pressure

Cardiac irregularities

depressed respiration

inebriation

Unconsciousness

narcosis

Swallowing may result in damage to the following:

Liver

Kidney

The following applies to aliphatic halogenated hydrocarbons in general: systemic effect: narcosis, cardiovascular disorders. Toxic effect on liver, kidneys.

Other dangerous properties can not be excluded.

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

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|                                                     |                                                                                                       |
|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| Toxicity to fish                                    | flow-through test LC50 - Pimephales promelas (fathead minnow) - 193.00 mg/l - 96 h<br>Remarks: (ECHA) |
| Toxicity to daphnia and other aquatic invertebrates | static test LC50 - Daphnia magna (Water flea) - 27 mg/l - 48 h (US-EPA)                               |
| Toxicity to bacteria                                | static test EC50 - activated sludge - 2,590 mg/l - 40 min (OECD Test Guideline 209)                   |
| Toxicity to fish(Chronic toxicity)                  | flow-through test LC50 - Pimephales promelas (fathead minnow) - 471 mg/l - 8 d<br>Remarks: (ECHA)     |

## 12.2 Persistence and degradability

Biodegradability      aerobic - Exposure time 28 d  
Result: 68 % - Readily biodegradable.  
(OECD Test Guideline 301D)

## 12.3 Bioaccumulative potential

Bioaccumulation      Cyprinus carpio (Carp) - 6 Weeks  
- 250 µg/l(Dichloromethane)

Bioconcentration factor (BCF): 2 - 5.4  
(OECD Test Guideline 305)

Cyprinus carpio (Carp) - 6 Weeks  
- 25 µg/l(Dichloromethane)

Bioconcentration factor (BCF): 6 - 40  
(OECD Test Guideline 305)

## 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 Endocrine disrupting properties

No data available

## 12.7 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.

---

## SECTION 14: Transport information

#### DOT (US)

UN number: 1593    Class: 6.1    Packing group: III  
Proper shipping name: Dichloromethane  
Reportable Quantity (RQ): 1000 lbs  
Poison Inhalation Hazard: No

#### IMDG

UN number: 1593    Class: 6.1    Packing group: III    EMS-No: F-A, S-A  
Proper shipping name: DICHLOROMETHANE

#### IATA

UN number: 1593    Class: 6.1    Packing group: III  
Proper shipping name: Dichloromethane

---

## SECTION 15: Regulatory information

#### US TSCA Section 3

This chemical/product is not and cannot be distributed in commerce (as defined in TSCA section 3(5)) or processed (as defined in TSCA section 3(13)) for consumer paint or coating removal.

#### 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 |
|-----------------|---------|---------------|
| Dichloromethane | 75-09-2 | 2007-07-01    |

#### SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

#### Massachusetts Right To Know Components

|                 | CAS-No. | Revision Date |
|-----------------|---------|---------------|
| Dichloromethane | 75-09-2 | 2007-07-01    |

#### Pennsylvania Right To Know Components

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Dichloromethane

CAS-No.  
75-09-2

Revision Date  
2007-07-01

**California Prop. 65 Components**

, which is/are known to the State of California to cause cancer. For more information go to [www.P65Warnings.ca.gov/Dichloromethane](http://www.P65Warnings.ca.gov/Dichloromethane)

CAS-No.  
75-09-2

Revision Date  
2007-09-28

**Other regulations**

This chemical/product is not and cannot be distributed in commerce (as defined in TSCA section 3(5)) or processed (as defined in TSCA section 3(13)) for consumer paint or coating removal.

---

**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: 6.15

Revision Date: 08/09/2023

Print Date: 10/07/2023

## SAFETY DATA SHEET

Version 6.7  
Revision Date 08/26/2023  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Naphthalene

Product Number : 147141  
Brand : Aldrich  
Index-No. : 601-052-00-2  
CAS-No. : 91-20-3

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

Company : Sigma-Aldrich 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 solids (Category 2), H228  
Acute toxicity, Oral (Category 4), H302  
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

Warning

Hazard statement(s)

H228 Flammable solid.  
H302 Harmful if swallowed.  
H351 Suspected of causing cancer.  
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201 Obtain special instructions before use.  
P202 Do not handle until all safety precautions have been read and understood.  
P210 Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.  
P240 Ground/bond container and receiving equipment.  
P241 Use explosion-proof electrical/ ventilating/ lighting/ equipment.  
P264 Wash skin thoroughly after handling.  
P270 Do not eat, drink or smoke when using this product.  
P273 Avoid release to the environment.  
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.  
P301 + P312 + P330 IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth.  
P308 + P313 IF exposed or concerned: Get medical advice/ attention.  
P370 + P378 In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.  
P391 Collect spillage.  
P405 Store locked up.  
P501 Dispose of contents/ container to an approved waste disposal plant.

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Formula : C<sub>10</sub>H<sub>8</sub>  
Molecular weight : 128.17 g/mol  
CAS-No. : 91-20-3  
EC-No. : 202-049-5  
Index-No. : 601-052-00-2

| Component          | Classification                                                                                                 | Concentration |
|--------------------|----------------------------------------------------------------------------------------------------------------|---------------|
| <b>Naphthalene</b> |                                                                                                                |               |
|                    | Flam. Sol. 2; Acute Tox. 4;<br>Carc. 2; Aquatic Acute 1;<br>Aquatic Chronic 1; H228,<br>H302, H351, H400, H410 | <= 100 %      |

---

## **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**

After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

## **SECTION 5: Firefighting measures**

### **5.1 Extinguishing media**

#### **Suitable extinguishing media**

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

### **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: Avoid inhalation of dusts. 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. Risk of explosion.

### **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 dry. 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.

#### **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 away from heat and sources of ignition.

#### **Storage class**

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**

| Component   | CAS-No. | Value                                                                                          | Control parameters               | Basis                                                                                   |
|-------------|---------|------------------------------------------------------------------------------------------------|----------------------------------|-----------------------------------------------------------------------------------------|
| Naphthalene | 91-20-3 | TWA                                                                                            | 10 ppm                           | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|             | Remarks | Confirmed animal carcinogen with unknown relevance to humans<br>Danger of cutaneous absorption |                                  |                                                                                         |
|             |         | TWA                                                                                            | 10 ppm<br>50 mg/m <sup>3</sup>   | USA. NIOSH Recommended Exposure Limits                                                  |
|             |         | ST                                                                                             | 15 ppm<br>75 mg/m <sup>3</sup>   | USA. NIOSH Recommended Exposure Limits                                                  |
|             |         | TWA                                                                                            | 10 ppm<br>50 mg/m <sup>3</sup>   | USA. Occupational Exposure Limits (OSHA) - Table Z-1<br>Limits for Air Contaminants     |
|             |         | PEL                                                                                            | 0.1 ppm<br>0.5 mg/m <sup>3</sup> | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|             |         | Skin                                                                                           |                                  |                                                                                         |

#### Biological occupational exposure limits

| Component   | CAS-No. | Parameters                                               | Value | Biological specimen | Basis                                     |
|-------------|---------|----------------------------------------------------------|-------|---------------------|-------------------------------------------|
| Naphthalene | 91-20-3 | 1-Naphthol + 2-Naphthol                                  |       |                     | ACGIH - Biological Exposure Indices (BEI) |
|             | Remarks | End of shift (As soon as possible after exposure ceases) |       |                     |                                           |

## 8.2 Exposure controls

### Appropriate engineering controls

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

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 EN 16523-1 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 Dermatrill® L

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 EN 16523-1 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: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: KCL 741 Dermatril® L

### **Body Protection**

Flame retardant antistatic protective clothing.

### **Respiratory protection**

Recommended Filter type: Filter A-(P3)

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer.

These measures have to be properly documented.

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. Risk of explosion.

---

## **SECTION 9: Physical and chemical properties**

### **9.1 Information on basic physical and chemical properties**

|                                                 |                                                                                            |
|-------------------------------------------------|--------------------------------------------------------------------------------------------|
| a) Appearance                                   | Form: flakes, granules<br>Color: white                                                     |
| b) Odor                                         | aromatic                                                                                   |
| 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      | 218 °C 424 °F - lit.                                                                       |
| g) Flash point                                  | 78.5 °C (173.3 °F) - closed cup - ISO 2719                                                 |
| h) Evaporation rate                             | No data available                                                                          |
| i) Flammability (solid, gas)                    | The substance or mixture is a flammable solid with the category 2. - Flammability (solids) |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 5.9 %(V)<br>Lower explosion limit: 0.9 %(V)                         |
| k) Vapor pressure                               | 0.072 hPa at 20 °C (68 °F) - OECD Test Guideline 104                                       |
| l) Vapor density                                | No data available                                                                          |
| m) Density                                      | 1.08 g/cm <sup>3</sup> at 24.7 °C (76.5 °F) - OECD Test Guideline 109                      |
| Relative density                                | No data available                                                                          |

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|                                           |                                                                                            |
|-------------------------------------------|--------------------------------------------------------------------------------------------|
| n) Water solubility                       | 0.0308 g/l at 25 °C (77 °F) - OECD Test Guideline 105 - slightly soluble                   |
| o) Partition coefficient: n-octanol/water | log Pow: 3.4 at 25 °C (77 °F) - OECD Test Guideline 107 - Bioaccumulation is not expected. |
| p) Autoignition temperature               | 526 - 587 °C (979 - 1089 °F) at 1,013 hPa - DIN 51794                                      |
| q) Decomposition temperature              | No data available                                                                          |
| r) Viscosity                              | No data available                                                                          |
| s) Explosive properties                   | No data available                                                                          |
| t) Oxidizing properties                   | none                                                                                       |

## 9.2 Other safety information

|                 |                                  |
|-----------------|----------------------------------|
| Surface tension | 31.8 mN/m at 100.0 °C (212.0 °F) |
|-----------------|----------------------------------|

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

Forms explosive mixtures with air on intense heating.

A range from approx. 15 Kelvin below the flash point is to be rated as critical.

The following applies in general to flammable organic substances and mixtures: in correspondingly fine distribution, when whirled up a dust explosion potential may generally be assumed.

### 10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

### 10.3 Possibility of hazardous reactions

Violent reactions possible with:

Oxidizing agents

chromium(VI) oxide

benzoyl chloride

aluminium chloride

Risk of explosion with:

nitrogen oxides

### 10.4 Conditions to avoid

Heat, flames and sparks.

Strong heating.

### 10.5 Incompatible materials

No data available

### 10.6 Hazardous decomposition products

In the event of fire: see section 5



---

## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

#### Acute toxicity

LD50 Oral - Mouse - female - 710 mg/kg  
(OECD Test Guideline 401)

LC50 Inhalation - Rat - male and female - 4 h - > 0.4 mg/l - vapor

(OECD Test Guideline 403)

LD50 Dermal - Rabbit - 20,000 mg/kg

Remarks: (RTECS)

No data available

#### Skin corrosion/irritation

Skin - Rabbit

Result: No skin irritation - 24 h

Remarks: (ECHA)

#### Serious eye damage/eye irritation

Eyes - Rabbit

Result: No eye irritation - 24 h

Remarks: (ECHA)

#### Respiratory or skin sensitization

Maximization Test - Guinea pig

Result: negative

(OECD Test Guideline 406)

#### Germ cell mutagenicity

Test Type: Mutagenicity (mammal cell test): chromosome aberration.

Test system: Chinese hamster ovary cells

Metabolic activation: Metabolic activation

Method: OECD Test Guideline 473

Result: positive

Test Type: Ames test

Test system: Salmonella typhimurium

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 471

Result: negative

Test Type: unscheduled DNA synthesis assay

Species: Rat

Cell type: Liver cells

Application Route: Oral

Method: OECD Test Guideline 486

Result: negative

Test Type: Micronucleus test

Species: Mouse

Cell type: Bone marrow

Application Route: Intraperitoneal

Method: US-EPA

Result: negative

Remarks: (ECHA)

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### **Carcinogenicity**

Suspected of causing cancer.

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Naphthalene)

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. (Naphthalene)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (Naphthalene)

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. (Naphthalene)

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**

Repeated dose toxicity - Rat - male and female - Oral - 91 Days - NOAEL (No observed adverse effect level) - 200 mg/kg - LOAEL (Lowest observed adverse effect level) - 400 mg/kg

Repeated dose toxicity - Mouse - male and female - Oral - 90 Days - NOAEL (No observed adverse effect level) - 100 mg/kg

Repeated dose toxicity - Rat - male and female - Dermal - 90 Days - NOAEL (No observed adverse effect level) - 1,000 mg/kg

Repeated dose toxicity - Rat - male and female - inhalation (vapor) - 90 Days - NOAEL (No observed adverse effect level) - 300 mg/kg

RTECS: QJ0525000

Absorption into the body leads to the formation of methemoglobin which in sufficient concentration causes cyanosis. Onset may be delayed 2 to 4 hours or longer., Naphthalene is retinotoxic and systemic absorption of its vapors above 15ppm, may result in: cataracts, optic neuritis, corneal injury, Eye irritation, Ingestion may provoke the following symptoms: hemolytic anemia, hemoglobinuria, Nausea, Headache, Vomiting, Gastrointestinal disturbance, Convulsions, anemia, Kidney injury may occur., Seizures., Coma.

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

Heart -

---

## SECTION 12: Ecological information

### 12.1 Toxicity

|                                                     |                                                                                                                     |
|-----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Toxicity to fish                                    | flow-through test LC50 - <i>Oncorhynchus mykiss</i> (rainbow trout) - 1.6 mg/l - 96 h<br>(OECD Test Guideline 203)  |
|                                                     | flow-through test LC50 - <i>Pimephales promelas</i> (fathead minnow) - 7.9 mg/l - 96 h<br>(OECD Test Guideline 203) |
| Toxicity to daphnia and other aquatic invertebrates | static test EC50 - <i>Daphnia magna</i> (Water flea) - 2.16 mg/l - 48 h<br>(OECD Test Guideline 202)                |
| Toxicity to algae                                   | static test EC50 - <i>Pseudokirchneriella subcapitata</i> (green algae) - 2.96 mg/l - 4 h<br>Remarks: (ECHA)        |
| Toxicity to fish(Chronic toxicity)                  | flow-through test LC50 - <i>Oncorhynchus kisutch</i> (coho salmon) - 2.1 mg/l - 96 h<br>Remarks: (ECHA)             |

### 12.2 Persistence and degradability

|                  |                                                                                                        |
|------------------|--------------------------------------------------------------------------------------------------------|
| Biodegradability | aerobic - Exposure time 28 d<br>Result: 2 % - Not readily biodegradable.<br>(OECD Test Guideline 302C) |
|------------------|--------------------------------------------------------------------------------------------------------|

### 12.3 Bioaccumulative potential

|                 |                                                                                                                                                                                       |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bioaccumulation | <i>Cyprinus carpio</i> (Carp) - 56 d at 25 °C(Naphthalene)<br><br>Bioconcentration factor (BCF): 36.5 - 168<br>(OECD Test Guideline 305)<br><br>Remarks: Bioaccumulation is unlikely. |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### 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 Endocrine disrupting properties

No data available

### 12.7 Other adverse effects

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

---

## 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: 1334    Class: 4.1    Packing group: III  
Proper shipping name: Naphthalene, refined  
Reportable Quantity (RQ): 100 lbs  
Marine pollutant: yes    Poison Inhalation Hazard: No

#### IMDG

UN number: 1334    Class: 4.1    Packing group: III    EMS-  
No: F-A, S-G  
Proper shipping name: NAPHTHALENE, REFINED  
Marine pollutant : yes

#### IATA

UN number: 1334    Class: 4.1    Packing group: III  
Proper shipping name: Naphthalene, refined

---

## SECTION 15: Regulatory information

#### SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

#### SARA 313 Components

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

#### SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

#### Massachusetts Right To Know Components

|             | CAS-No. | Revision Date |
|-------------|---------|---------------|
| Naphthalene | 91-20-3 |               |

---

## 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: 6.7

Revision Date: 08/26/2023

Print Date: 10/07/2023

## SAFETY DATA SHEET

Version 6.3  
Revision Date 11/21/2022  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Butylbenzene

Product Number : B90203  
Brand : Aldrich  
CAS-No. : 104-51-8

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

Company : Sigma-Aldrich 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 3), H226

For the full text of the H-Statements mentioned in this Section, see Section 16.

**2.2 GHS Label elements, including precautionary statements**

Pictogram



Signal Word : Warning

Hazard statement(s)  
H226 : Flammable liquid and vapor.

Precautionary statement(s)  
P210 : Keep away from heat/ sparks/ open flames/ hot surfaces. No

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|                    |                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------|
|                    | smoking.                                                                                             |
| P233               | Keep container tightly closed.                                                                       |
| P240               | Ground/bond container and receiving equipment.                                                       |
| P241               | Use explosion-proof electrical/ ventilating/ lighting/ equipment.                                    |
| P242               | Use only non-sparking tools.                                                                         |
| P243               | Take precautionary measures against static discharge.                                                |
| P280               | Wear protective gloves/ eye protection/ face protection.                                             |
| P303 + P361 + P353 | IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower. |
| P370 + P378        | In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.                 |
| P403 + P235        | Store in a well-ventilated place. Keep cool.                                                         |
| P501               | Dispose of contents/ container to an approved waste disposal plant.                                  |

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

|                  |                                   |
|------------------|-----------------------------------|
| Synonyms         | : 1-Phenylbutane                  |
| Formula          | : C <sub>10</sub> H <sub>14</sub> |
| Molecular weight | : 134.22 g/mol                    |
| CAS-No.          | : 104-51-8                        |
| EC-No.           | : 203-209-7                       |

| Component           | Classification     | Concentration |
|---------------------|--------------------|---------------|
| <b>Butylbenzene</b> |                    |               |
|                     | Flam. Liq. 3; H226 | <= 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.

#### In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

#### In case of eye contact

After eye contact: rinse out with plenty of water. Remove contact lenses.

#### If swallowed

After swallowing: make victim drink water (two glasses at most). Consult doctor if feeling unwell.

#### **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**

##### **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

Vapors are heavier than air and may spread along floors.

Forms explosive mixtures with air at elevated temperatures.

#### **5.3 Advice for firefighters**

In the event of fire, wear self-contained breathing apparatus.

#### **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. 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. Risk of explosion.

#### **6.3 Methods and materials for containment and cleaning up**

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent material (e.g. Chemisorb® ). 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**

Change contaminated clothing. Wash hands after working with substance.



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. Keep away from heat and sources of ignition.

### **Storage class**

Storage class (TRGS 510): 3: Flammable liquids

## **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**

Change contaminated clothing. Wash hands after working with substance.

#### **Personal protective equipment**

##### **Eye/face protection**

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

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the 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.

**Respiratory protection**

required when vapours/aerosols are generated.

**Control of environmental exposure**

Do not let product enter drains. Risk of explosion.

---

**SECTION 9: Physical and chemical properties****9.1 Information on basic physical and chemical properties**

|                                                 |                                                                    |
|-------------------------------------------------|--------------------------------------------------------------------|
| a) Appearance                                   | Form: liquid, clear<br>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: -88 °C (-126 °F) - lit.                       |
| f) Initial boiling point and boiling range      | 183 °C 361 °F - lit.                                               |
| g) Flash point                                  | 59.0 °C (138.2 °F) - closed cup                                    |
| h) Evaporation rate                             | No data available                                                  |
| i) Flammability (solid, gas)                    | No data available                                                  |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 5.8 %(V)<br>Lower explosion limit: 0.8 %(V) |
| k) Vapor pressure                               | No data available                                                  |
| l) Vapor density                                | No data available                                                  |
| m) Density                                      | 0.86 g/cm <sup>3</sup> at 25 °C (77 °F) - lit.                     |
| Relative density                                | No data available                                                  |
| n) Water solubility                             | insoluble                                                          |
| o) Partition coefficient: n-octanol/water       | No data available                                                  |
| p) Autoignition temperature                     | 412.0 °C (773.6 °F)                                                |
| q) Decomposition temperature                    | No data available                                                  |
| r) Viscosity                                    | No data available                                                  |
| s) Explosive properties                         | No data available                                                  |
| t) Oxidizing properties                         | No data available                                                  |

## 9.2 Other safety information

No data available

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

Vapor/air-mixtures are explosive at intense warming.

### 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

Heating.

### 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

Oral: No data available

Inhalation: No data available

Dermal: No data available

No data available

#### Skin corrosion/irritation

Remarks: No data available

#### Serious eye damage/eye irritation

Remarks: 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

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: CY9070000

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

---

**SECTION 12: Ecological information**

**12.1 Toxicity**

No data available

**12.2 Persistence and degradability**

No data available

**12.3 Bioaccumulative potential**

No data available

**12.4 Mobility in soil**

No data available

**12.5 Results of PBT and vPvB assessment**

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

**12.6 Endocrine disrupting properties**

No data available

**12.7 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.

---

**SECTION 14: Transport information**

**DOT (US)**

UN number: 2709 Class: 3

Packing group: III

Proper shipping name: Butyl benzenes

Reportable Quantity (RQ):

Aldrich - B90203

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Marine pollutant: yes      Poison Inhalation Hazard: No

**IMDG**

UN number: 2709      Class: 3      Packing group: III      EMS-  
No: F-E, S-D  
Proper shipping name: BUTYLBENZENES  
Marine pollutant : yes  
Marine pollutant : yes

**IATA**

UN number: 2709      Class: 3      Packing group: III  
Proper shipping name: Butylbenzenes

---

**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**

|              |                     |                             |
|--------------|---------------------|-----------------------------|
| Butylbenzene | CAS-No.<br>104-51-8 | Revision Date<br>1993-04-24 |
|--------------|---------------------|-----------------------------|

**Pennsylvania Right To Know Components**

|              |                     |                             |
|--------------|---------------------|-----------------------------|
| Butylbenzene | CAS-No.<br>104-51-8 | Revision Date<br>1993-04-24 |
|--------------|---------------------|-----------------------------|

**New Jersey Right To Know Components**

|              |                     |                             |
|--------------|---------------------|-----------------------------|
| Butylbenzene | CAS-No.<br>104-51-8 | Revision Date<br>1993-04-24 |
|--------------|---------------------|-----------------------------|

**California Prop. 65 Components**

This product does not contain any chemicals known to the State of California to cause cancer, birth, or any other reproductive defects.

---

**SECTION 16: Other information****Further information**

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See

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Version: 6.3

Revision Date: 11/21/2022

Print Date: 10/07/2023

## SAFETY DATA SHEET

Version 6.11  
Revision Date 06/01/2023  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Nitric acid

Product Number : 438073  
Brand : SIGALD  
Index-No. : 007-004-00-1  
CAS-No. : 7697-37-2

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

Company : Sigma-Aldrich Inc.  
3050 SPRUCE ST  
ST. LOUIS MO 63103  
UNITED STATES

Telephone : +1 314 771-5765  
Fax : +1 800 325-5052

**1.4 Emergency telephone**

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)**

Oxidizing liquids (Category 3), H272  
Corrosive to Metals (Category 1), H290  
Acute toxicity, Inhalation (Category 3), H331  
Skin corrosion (Category 1A), H314  
Serious eye damage (Category 1), H318

For the full text of the H-Statements mentioned in this Section, see Section 16.

**2.2 GHS Label elements, including precautionary statements**

Pictogram



Signal Word

Danger

Hazard statement(s)

H272 May intensify fire; oxidizer.  
H290 May be corrosive to metals.  
H314 Causes severe skin burns and eye damage.  
H331 Toxic if inhaled.

Precautionary statement(s)

P210 Keep away from heat.  
P220 Keep/Store away from clothing/ combustible materials.  
P221 Take any precaution to avoid mixing with combustibles.  
P234 Keep only in original container.  
P261 Avoid breathing mist or vapors.  
P264 Wash skin thoroughly after handling.  
P271 Use only outdoors or in a well-ventilated area.  
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.  
  
P301 + P330 + P331 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.  
P303 + P361 + P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.  
  
P304 + P340 + P310 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor.  
  
P305 + P351 + P338 + P310 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/ doctor.  
  
P363 Wash contaminated clothing before reuse.  
P370 + P378 In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.  
  
P390 Absorb spillage to prevent material damage.  
P403 + P233 Store in a well-ventilated place. Keep container tightly closed.  
P405 Store locked up.  
P406 Store in corrosive resistant container with a resistant inner liner.  
  
P501 Dispose of contents/ container to an approved waste disposal plant.

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Corrosive to the respiratory tract.

## SECTION 3: Composition/information on ingredients

### 3.2 Mixtures

Formula : HNO<sub>3</sub>

| Component          |           | Classification            | Concentration  |
|--------------------|-----------|---------------------------|----------------|
| <b>nitric acid</b> |           |                           |                |
| CAS-No.            | 7697-37-2 | Ox. Liq. 3; Met. Corr. 1; | >= 70 - < 90 % |
| EC-No.             | 231-714-2 | Acute Tox. 3; Skin Corr.  |                |

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|                                     |                                           |                                                                                                                                                                                                                                                                                                                    |  |
|-------------------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Index-No.<br>Registration<br>number | 007-030-00-3<br>01-2119487297-23-<br>XXXX | 1A; Eye Dam. 1; H272,<br>H290, H331, H314, H318<br>Concentration limits:<br>>= 1 %: Met. Corr. 1,<br>H290; >= 65 %: Ox. Liq.<br>3, H272; >= 20 %: Skin<br>Corr. 1A, H314; 5 - < 20<br>%: Skin Corr. 1B, H314;<br>>= 3 %: Eye Dam. 1,<br>H318; 1 - < 3 %: Eye<br>Irrit. 2, H319; 1 - < 5 %:<br>Skin Irrit. 2, H315; |  |
|-------------------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

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. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

#### In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Call a physician immediately.

#### In case of eye contact

After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist. Remove contact lenses.

#### If swallowed

After swallowing: make victim drink water (two glasses at most), avoid vomiting (risk of perforation). Call a physician immediately. Do not attempt to neutralise.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

#### Suitable extinguishing media

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

**Unsuitable extinguishing media**

For this substance/mixture no limitations of extinguishing agents are given.

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

Nitrogen oxides (NO<sub>x</sub>)

Not combustible.

Has a fire-promoting effect due to release of oxygen.

Ambient fire may liberate hazardous vapours.

**5.3 Advice for firefighters**

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

**5.4 Further information**

Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

---

**SECTION 6: Accidental release measures****6.1 Personal precautions, protective equipment and emergency procedures**

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.

For personal protection see section 8.

**6.2 Environmental precautions**

Do not let product enter drains.

**6.3 Methods and materials for containment and cleaning up**

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up 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 safe handling**

Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

**Advice on protection against fire and explosion**

Keep away from open flames, hot surfaces and sources of ignition.

**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**

No metal containers.

Tightly closed. Keep locked up or in an area accessible only to qualified or authorized persons. Do not store near combustible materials.

### Storage class

Storage class (TRGS 510): 5.1B: Oxidizing 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                                                                                   |
|-------------|-----------|-------|-------------------------------|-----------------------------------------------------------------------------------------|
| nitric acid | 7697-37-2 | TWA   | 2 ppm                         | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|             |           | STEL  | 4 ppm                         | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|             |           | ST    | 4 ppm<br>10 mg/m <sup>3</sup> | USA. NIOSH Recommended Exposure Limits                                                  |
|             |           | TWA   | 2 ppm<br>5 mg/m <sup>3</sup>  | USA. NIOSH Recommended Exposure Limits                                                  |
|             |           | TWA   | 2 ppm<br>5 mg/m <sup>3</sup>  | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|             |           | PEL   | 2 ppm<br>5 mg/m <sup>3</sup>  | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|             |           | STEL  | 4 ppm<br>10 mg/m <sup>3</sup> | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |

### 8.2 Exposure controls

#### Appropriate engineering controls

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

#### Personal protective equipment

##### Eye/face protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Tightly fitting safety goggles

##### Skin protection

required

##### Body Protection

protective clothing

**Respiratory protection**

required when vapours/aerosols are generated.

Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

**Control of environmental exposure**

Do not let product enter drains.

---

**SECTION 9: Physical and chemical properties****9.1 Information on basic physical and chemical properties**

|                                                 |                      |
|-------------------------------------------------|----------------------|
| a) Appearance                                   | Form: liquid         |
| b) Odor                                         | No data available    |
| c) Odor Threshold                               | No data available    |
| d) pH                                           | No data available    |
| e) Melting point/freezing point                 | No data available    |
| f) Initial boiling point and boiling range      | No data available    |
| g) Flash point                                  | ( )No data available |
| h) Evaporation rate                             | No data available    |
| i) Flammability (solid, gas)                    | No data available    |
| j) Upper/lower flammability or explosive limits | No data available    |
| k) Vapor pressure                               | No data available    |
| l) Vapor density                                | No data available    |
| m) 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                     | Not applicable       |
| q) Decomposition temperature                    | No data available    |
| r) Viscosity                                    | No data available    |
| s) Explosive properties                         | No data available    |
| t) Oxidizing properties                         | No data available    |

## 9.2 Other safety information

No data available

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .  
Stable under recommended storage conditions.

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to avoid

May discolor on exposure to air and light.  
no information available

### 10.5 Incompatible materials

Strong oxidizing agentsMetals

### 10.6 Hazardous decomposition products

In the event of fire: see section 5

---

## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

#### Mixture

#### Acute toxicity

Symptoms: If ingested, severe burns of the mouth and throat, as well as a danger of perforation of the esophagus and the stomach.

Acute toxicity estimate Inhalation - 4 h - 3.79 mg/l - vapor(Calculation method)

Symptoms: Possible symptoms:, mucosal irritations, Cough, Shortness of breath, Possible damages:, damage of respiratory tract

Dermal: No data available

#### Skin corrosion/irritation

Remarks: Mixture causes severe burns.

#### Serious eye damage/eye irritation

Remarks: Mixture causes serious eye damage.

Risk of blindness!

#### 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

**11.2 Additional Information**

RTECS: QU5775000

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

Other dangerous properties can not be excluded.

Handle in accordance with good industrial hygiene and safety practice.

Liver - Irregularities - Based on Human Evidence

**Components**

**nitric acid**

**Acute toxicity**

Oral: No data available

Acute toxicity estimate Inhalation - 4 h - 2.65 mg/l - vapor  
(Expert judgment)

Dermal: No data available

**Skin corrosion/irritation**

Skin - Rabbit

Result: Causes severe burns.

Remarks: (IUCLID)

Remarks: Causes poorly healing wounds.

**Serious eye damage/eye irritation**

Eyes - Rabbit

Result: Causes burns.

Remarks: (IUCLID)

Remarks: Causes serious eye damage.

**Respiratory or skin sensitization**

No data available

**Germ cell mutagenicity**

Test Type: Ames test

Test system: Salmonella typhimurium

Result: negative

**Carcinogenicity**

No data available

**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

---

**SECTION 12: Ecological information****12.1 Toxicity****Mixture**

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 Endocrine disrupting properties**

No data available

**12.7 Other adverse effects**

No data available

**Components****nitric acid**

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.

---

## SECTION 14: Transport information

#### DOT (US)

UN number: 2031    Class: 8 (5.1)    Packing group: II  
Proper shipping name: Nitric acid  
Reportable Quantity (RQ): 1428 lbs  
Poison Inhalation Hazard: No

#### IMDG

UN number: 2031    Class: 8 (5.1)    Packing group: II    EMS-No: F-A, S-Q  
Proper shipping name: NITRIC ACID

#### IATA

UN number: 2031    Class: 8 (5.1)    Packing group: II  
Proper shipping name: Nitric acid  
IATA Passenger: Not permitted for transport

---

## SECTION 15: Regulatory information

#### SARA 302 Components

|             |                      |                             |
|-------------|----------------------|-----------------------------|
| nitric acid | CAS-No.<br>7697-37-2 | Revision Date<br>2007-07-01 |
|-------------|----------------------|-----------------------------|

#### SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

|             |                      |                             |
|-------------|----------------------|-----------------------------|
| nitric acid | CAS-No.<br>7697-37-2 | Revision Date<br>2007-07-01 |
|-------------|----------------------|-----------------------------|

#### SARA 311/312 Hazards

Chronic Health Hazard

#### Massachusetts Right To Know Components

|             |                      |                             |
|-------------|----------------------|-----------------------------|
| nitric acid | CAS-No.<br>7697-37-2 | Revision Date<br>2007-07-01 |
| water       | 7732-18-5            |                             |

#### Pennsylvania Right To Know Components

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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: 6.11

Revision Date: 06/01/2023

Print Date: 10/07/2023

## SAFETY DATA SHEET

Version 6.5  
Revision Date 09/13/2023  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Propylbenzene

Product Number : P52407  
Brand : Aldrich  
Index-No. : 601-024-00-X  
CAS-No. : 103-65-1

**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)**

Flammable liquids (Category 3), H226  
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335  
Aspiration hazard (Category 1), H304  
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)

H226

Flammable liquid and vapor.

H304

May be fatal if swallowed and enters airways.

H335

May cause respiratory irritation.

H411

Toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P210

Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.

P233

Keep container tightly closed.

P240

Ground/bond container and receiving equipment.

P241

Use explosion-proof electrical/ ventilating/ lighting/ equipment.

P242

Use only non-sparking tools.

P243

Take precautionary measures against static discharge.

P261

Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray.

P271

Use only outdoors or in a well-ventilated area.

P273

Avoid release to the environment.

P280

Wear protective gloves/ eye protection/ face protection.

P301 + P310

IF SWALLOWED: Immediately call a POISON CENTER/ doctor.

P303 + P361 + P353

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

P304 + P340 + P312

IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell. Do NOT induce vomiting.

P331

P370 + P378

In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.

P391

Collect spillage.

P403 + P233

Store in a well-ventilated place. Keep container tightly closed.

P403 + P235

Store in a well-ventilated place. Keep cool.

P405

Store locked up.

P501

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

## 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

### SECTION 3: Composition/information on ingredients

#### 3.1 Substances

Synonyms : 1-Phenylpropane

Formula : C<sub>9</sub>H<sub>12</sub>

Molecular weight : 120.19 g/mol

CAS-No. : 103-65-1

EC-No. : 203-132-9

Index-No. : 601-024-00-X

| Component | Classification | Concentration |
|-----------|----------------|---------------|
|-----------|----------------|---------------|

|                      |                                                                                                                    |          |
|----------------------|--------------------------------------------------------------------------------------------------------------------|----------|
| <b>propylbenzene</b> |                                                                                                                    |          |
|                      | Flam. Liq. 3; STOT SE 3;<br>Asp. Tox. 1; Aquatic Acute<br>2; Aquatic Chronic 2;<br>H226, H335, H304, H401,<br>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

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.

#### In case of eye contact

After eye contact: rinse out with plenty of water. Remove contact lenses.

#### If swallowed

After swallowing: caution if victim vomits. Risk of aspiration! Keep airways free. Pulmonary failure possible after aspiration of vomit. Call a physician immediately.

### 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

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 at elevated temperatures.

Development of hazardous combustion gases or vapours possible in the event of fire.

### **5.3 Advice for firefighters**

In the event of fire, wear self-contained breathing apparatus.

### **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. Risk of explosion.

### **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**

Change contaminated clothing. Wash hands after working with substance. 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. Keep away from heat and sources of ignition.

#### **Storage class**

Storage class (TRGS 510): 3: Flammable liquids

### **7.3 Specific end use(s)**

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

---

## SECTION 8: Exposure controls/personal protection

### 8.1 Control parameters

#### Ingredients with workplace control parameters

Contains no substances with occupational exposure limit values.

### 8.2 Exposure controls

#### Appropriate engineering controls

Change contaminated clothing. Wash hands after working with substance.

#### Personal protective equipment

##### Eye/face protection

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

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 30 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the 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.

##### Respiratory protection

Recommended Filter type: Filter type ABEK

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer.

These measures have to be properly documented.

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. Risk of explosion.

---

### SECTION 9: Physical and chemical properties

#### 9.1 Information on basic physical and chemical properties

|                                                 |                                                                  |
|-------------------------------------------------|------------------------------------------------------------------|
| a) Appearance                                   | Form: liquid, clear<br>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: -99 °C (-146 °F) - lit.                     |
| f) Initial boiling point and boiling range      | 159 °C 318 °F - lit.                                             |
| g) Flash point                                  | 42.0 °C (107.6 °F) - closed cup                                  |
| h) Evaporation rate                             | No data available                                                |
| i) Flammability (solid, gas)                    | No data available                                                |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 6 %(V)<br>Lower explosion limit: 0.8 %(V) |
| k) Vapor pressure                               | No data available                                                |
| l) Vapor density                                | No data available                                                |
| m) Density                                      | 0.862 g/cm <sup>3</sup> at 25 °C (77 °F) - lit.                  |
| Relative density                                | No data available                                                |
| n) Water solubility                             | slightly soluble                                                 |
| o) Partition coefficient: n-octanol/water       | No data available                                                |
| p) Autoignition temperature                     | 450.0 °C (842.0 °F)                                              |
| q) Decomposition temperature                    | No data available                                                |
| r) Viscosity                                    | No data available                                                |
| s) Explosive properties                         | No data available                                                |
| t) Oxidizing properties                         | none                                                             |

#### 9.2 Other safety information

No data available

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

Vapor/air-mixtures are explosive at intense warming.

### 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

Heating.

### 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 - 6,040 mg/kg

Remarks: Behavioral:Somnolence (general depressed activity).

LC50 Inhalation - Rat - 2 h - 65000 ppm

Dermal: No data available

No data available

#### Skin corrosion/irritation

Remarks: No data available

#### Serious eye damage/eye irritation

Remarks: 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

Aldrich - P52407

Page 7 of 10



May cause respiratory irritation.

**Specific target organ toxicity - repeated exposure**

No data available

**Aspiration hazard**

May be fatal if swallowed and enters airways.

**11.2 Additional Information**

RTECS: DA8750000

Damage to the lungs., 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                      LC50 - Oncorhynchus mykiss (rainbow trout) - 1.55 mg/l - 96.0 h

Toxicity to daphnia and other aquatic invertebrates                      Immobilization EC50 - Daphnia magna (Water flea) - 2 mg/l - 24 h

**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 Endocrine disrupting properties**

No data available

**12.7 Other adverse effects**

Avoid release to the environment.

---

**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: 2364    Class: 3    Packing group: III  
Proper shipping name: n-Propyl benzene  
Reportable Quantity (RQ):  
Poison Inhalation Hazard: No

**IMDG**

UN number: 2364    Class: 3    Packing group: III    EMS-No: F-E, S-D  
Proper shipping name: n-PROPYLBENZENE  
Marine pollutant : yes

**IATA**

UN number: 2364    Class: 3    Packing group: III  
Proper shipping name: n-Propylbenzene

---

**SECTION 15: Regulatory information****SARA 302 Components**

This material does not contain any components with a section 302 EHS TPQ.

**SARA 313 Components**

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

**SARA 311/312 Hazards**

Fire Hazard, Acute Health Hazard

**Massachusetts Right To Know Components**

|               |                     |                             |
|---------------|---------------------|-----------------------------|
| propylbenzene | CAS-No.<br>103-65-1 | Revision Date<br>1993-04-24 |
|---------------|---------------------|-----------------------------|

|               |                     |                             |
|---------------|---------------------|-----------------------------|
| propylbenzene | CAS-No.<br>103-65-1 | Revision Date<br>1993-04-24 |
|---------------|---------------------|-----------------------------|

**Pennsylvania Right To Know Components**

|               |                     |                             |
|---------------|---------------------|-----------------------------|
| propylbenzene | CAS-No.<br>103-65-1 | Revision Date<br>1993-04-24 |
|---------------|---------------------|-----------------------------|

|               |                     |                             |
|---------------|---------------------|-----------------------------|
| propylbenzene | CAS-No.<br>103-65-1 | Revision Date<br>1993-04-24 |
|---------------|---------------------|-----------------------------|

**New Jersey Right To Know Components**

|               |                     |                             |
|---------------|---------------------|-----------------------------|
| propylbenzene | CAS-No.<br>103-65-1 | Revision Date<br>1993-04-24 |
|---------------|---------------------|-----------------------------|

---

## 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: 09/13/2023

Print Date: 10/07/2023

## SAFETY DATA SHEET

Version 8.5  
Revision Date 02/07/2023  
Print Date 10/19/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Aroclor 1242 solution

Product Number : 48706  
Brand : Supelco

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

Company : Sigma-Aldrich 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 2), H225  
Acute toxicity, Oral (Category 3), H301  
Acute toxicity, Inhalation (Category 3), H331  
Acute toxicity, Dermal (Category 3), H311  
Specific target organ toxicity - single exposure (Category 1), Eyes, Central nervous system, H370  
Specific target organ toxicity - repeated exposure (Category 2), H373

For the full text of the H-Statements mentioned in this Section, see Section 16.

**2.2 GHS Label elements, including precautionary statements**

Pictogram



Signal Word

Danger

|                            |                                                                                                          |
|----------------------------|----------------------------------------------------------------------------------------------------------|
| Hazard statement(s)        |                                                                                                          |
| H225                       | Highly flammable liquid and vapor.                                                                       |
| H301 + H311 + H331         | Toxic if swallowed, in contact with skin or if inhaled.                                                  |
| H370                       | Causes damage to organs (Eyes, Central nervous system).                                                  |
| H373                       | May cause damage to organs through prolonged or repeated exposure.                                       |
| Precautionary statement(s) |                                                                                                          |
| P210                       | Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.                                      |
| P233                       | Keep container tightly closed.                                                                           |
| P240                       | Ground/bond container and receiving equipment.                                                           |
| P241                       | Use explosion-proof electrical/ ventilating/ lighting/ equipment.                                        |
| P242                       | Use only non-sparking tools.                                                                             |
| P243                       | Take precautionary measures against static discharge.                                                    |
| P260                       | Do not breathe mist or vapors.                                                                           |
| P264                       | Wash skin thoroughly after handling.                                                                     |
| P270                       | Do not eat, drink or smoke when using this product.                                                      |
| P271                       | Use only outdoors or in a well-ventilated area.                                                          |
| P280                       | Wear protective gloves/ eye protection/ face protection.                                                 |
| P301 + P310 + P330         | IF SWALLOWED: Immediately call a POISON CENTER/ doctor. Rinse mouth.                                     |
| P303 + P361 + P353         | IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.     |
| P304 + P340 + P311         | IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor. |
| P307 + P311                | IF exposed: Call a POISON CENTER or doctor/ physician.                                                   |
| 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 + P233                | Store in a well-ventilated place. Keep container tightly closed.                                         |
| P403 + P235                | Store in a well-ventilated place. Keep cool.                                                             |
| P405                       | Store locked up.                                                                                         |
| P501                       | Dispose of contents/ container to an approved waste disposal plant.                                      |

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## SECTION 3: Composition/information on ingredients

### 3.2 Mixtures

| Component           |                       | Classification                                                                                                                                                     | Concentration    |
|---------------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| <b>Methanol</b>     |                       |                                                                                                                                                                    |                  |
| CAS-No.             | 67-56-1               | Flam. Liq. 2; Acute Tox. 3;<br>STOT SE 1; H225, H301,<br>H331, H311, H370<br>Concentration limits:<br>>= 10 %: STOT SE 1,<br>H370; 3 - < 10 %: STOT<br>SE 2, H371; | >= 90 - <= 100 % |
| EC-No.              | 200-659-6             |                                                                                                                                                                    |                  |
| Index-No.           | 603-001-00-X          |                                                                                                                                                                    |                  |
| Registration number | 01-2119433307-44-XXXX |                                                                                                                                                                    |                  |
| <b>Aroclor 1242</b> |                       |                                                                                                                                                                    |                  |
| CAS-No.             | 53469-21-9            | STOT RE 1: Aquatic Acute                                                                                                                                           | >= 0.005 - <     |

|           |              |                                                                                                                                                                              |       |
|-----------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| Index-No. | 602-039-00-4 | 1; Aquatic Chronic 1;<br>H372, H400, H410<br>Concentration limits:<br>≥ 0.005 %: STOT RE 2,<br>H373;<br>M-Factor - Aquatic Acute:<br>10<br>M-Factor - Aquatic<br>Chronic: 10 | 0.1 % |
|-----------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|

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. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

#### In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. 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

After swallowing: fresh air. Make victim drink ethanol (e.g. 1 drinking glass of a 40% alcoholic beverage). Call a doctor immediately (mention methanol ingestion). Only in exceptional cases, if no medical care is available within one hour, induce vomiting (only in fully conscious persons) and make victim drink ethanol again (approx. 0.3 ml of a 40% alcoholic beverage/kg body weight/hour).

### 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

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.

Pay attention to flashback.

Vapors are heavier than air and may spread along floors.

Development of hazardous combustion gases or vapours possible in the event of fire.

Forms explosive mixtures with air at ambient temperatures.

## **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. Risk of explosion.

### **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 safe handling**

Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

#### **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**

Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition. Keep locked up or in an area accessible only to qualified or authorized persons.

**Storage class**

Storage class (TRGS 510): 3: Flammable liquids

**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                                                                                   |
|-----------|---------|---------------------------------|----------------------|-----------------------------------------------------------------------------------------|
| Methanol  | 67-56-1 | TWA                             | 200 ppm              | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|           | Remarks | Danger of cutaneous absorption  |                      |                                                                                         |
|           |         | STEL                            | 250 ppm              | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|           |         | Danger of cutaneous absorption  |                      |                                                                                         |
|           |         | ST                              | 250 ppm<br>325 mg/m3 | USA. NIOSH Recommended Exposure Limits                                                  |
|           |         | Potential for dermal absorption |                      |                                                                                         |
|           |         | TWA                             | 200 ppm<br>260 mg/m3 | USA. NIOSH Recommended Exposure Limits                                                  |
|           |         | Potential for dermal absorption |                      |                                                                                         |
|           |         | TWA                             | 200 ppm<br>260 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|           |         | PEL                             | 200 ppm<br>260 mg/m3 | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|           |         | Skin                            |                      |                                                                                         |
|           |         | C                               | 1,000 ppm            | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|           |         | Skin                            |                      |                                                                                         |
|           |         | STEL                            | 250 ppm<br>325 mg/m3 | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|           |         | Skin                            |                      |                                                                                         |
|           |         | TWA                             | 200 ppm<br>260 mg/m3 | USA. Table Z-1-A Limits for Air Contaminants (1989 vacated values)                      |
|           |         | Skin notation                   |                      |                                                                                         |
|           |         | STEL                            | 250 ppm<br>325 mg/m3 | USA. Table Z-1-A Limits for Air Contaminants (1989 vacated values)                      |
|           |         | Skin notation                   |                      |                                                                                         |



|              |            |                                   |             |                                                                                         |
|--------------|------------|-----------------------------------|-------------|-----------------------------------------------------------------------------------------|
| Aroclor 1242 | 53469-21-9 | TWA                               | 1 mg/m3     | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|              |            | Danger of cutaneous absorption    |             |                                                                                         |
|              |            | TWA                               | 0.001 mg/m3 | USA. NIOSH Recommended Exposure Limits                                                  |
|              |            | Potential Occupational Carcinogen |             |                                                                                         |
|              |            | TWA                               | 1 mg/m3     | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|              |            | Skin designation                  |             |                                                                                         |
|              |            | PEL                               | 1 mg/m3     | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|              |            | Skin                              |             |                                                                                         |

#### Biological occupational exposure limits

| Component | CAS-No. | Parameters                                               | Value   | Biological specimen | Basis                                     |
|-----------|---------|----------------------------------------------------------|---------|---------------------|-------------------------------------------|
| Methanol  | 67-56-1 | Methanol                                                 | 15 mg/l | Urine               | ACGIH - Biological Exposure Indices (BEI) |
|           | Remarks | End of shift (As soon as possible after exposure ceases) |         |                     |                                           |

## 8.2 Exposure controls

### Appropriate engineering controls

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: butyl-rubber

Minimum layer thickness: 0.3 mm

Break through time: 480 min

Material tested: Butoject® (KCL 897 / Aldrich Z677647, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 30 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the 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.

#### **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. Risk of explosion.

---

## **SECTION 9: Physical and chemical properties**

### **9.1 Information on basic physical and chemical properties**

|                                                 |                                      |
|-------------------------------------------------|--------------------------------------|
| a) Appearance                                   | Form: liquid                         |
| b) Odor                                         | No data available                    |
| c) Odor Threshold                               | No data available                    |
| d) pH                                           | No data available                    |
| e) Melting point/freezing point                 | No data available                    |
| f) Initial boiling point and boiling range      | No data available                    |
| g) Flash point                                  | 11 °C (52 °F) - closed cup - Solvent |
| 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      | Not classified as explosive. |
| t) Oxidizing properties      | none                         |

## **9.2 Other safety information**

No data available

---

## **SECTION 10: Stability and reactivity**

### **10.1 Reactivity**

Vapors may form explosive mixture with air.

### **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**

Warming.

### **10.5 Incompatible materials**

Acids, Oxidizing agents, Alkali metals, Acid chlorides, Acid anhydrides, Reducing agents

### **10.6 Hazardous decomposition products**

In the event of fire: see section 5

---

## **SECTION 11: Toxicological information**

### **11.1 Information on toxicological effects**

#### **Mixture**

#### **Acute toxicity**

Acute toxicity estimate Oral - 100.1 mg/kg  
(Calculation method)

Acute toxicity estimate Inhalation - 4 h - 3.1 mg/l - vapor(Calculation method)

Acute toxicity estimate Dermal - 300.1 mg/kg  
(Calculation method)

#### **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 - 48706

Page 8 of 14

- 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**

Mixture causes damage to organs. - Eyes, Central nervous system

**Specific target organ toxicity - repeated exposure**

Mixture may cause damage to organs through prolonged or repeated exposure.

**Aspiration hazard**

No data available

**11.2 Additional Information**

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

Other dangerous properties can not be excluded.

Handle in accordance with good industrial hygiene and safety practice.

Stomach - Irregularities - Based on Human Evidence

**Components**

**Methanol**

**Acute toxicity**

Acute toxicity estimate Oral - 100.1 mg/kg

(Expert judgment)

Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Symptoms: Nausea, Vomiting

Acute toxicity estimate Inhalation - 4 h - 3.1 mg/l - vapor

(Expert judgment)

Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Symptoms: Irritation symptoms in the respiratory tract.

Acute toxicity estimate Dermal - 300.1 mg/kg

(Expert judgment)

Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

**Skin corrosion/irritation**

Skin - Rabbit

Result: No skin irritation

Remarks: (ECHA)

Remarks: Drying-out effect resulting in rough and chapped skin.

**Serious eye damage/eye irritation**

Eyes - Rabbit

Result: No eye irritation

Remarks: (ECHA)

**Respiratory or skin sensitization**

Sensitisation test: - Guinea pig

Result: negative

(OECD Test Guideline 406)

**Germ cell mutagenicity**

Based on available data the classification criteria are not met.

Test Type: Ames test

Test system: Salmonella typhimurium

Result: negative

Test Type: In vitro mammalian cell gene mutation test

Test system: Chinese hamster lung cells

Result: negative

Method: OECD Test Guideline 474

Species: Mouse - male and female - Bone marrow

Result: negative

**Carcinogenicity**

Did not show carcinogenic effects in animal experiments.

**Reproductive toxicity**

Based on available data the classification criteria are not met.

**Specific target organ toxicity - single exposure**

Causes damage to organs. - Eyes, Central nervous system

Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Acute oral toxicity - Nausea, Vomiting

Acute inhalation toxicity - Irritation symptoms in the respiratory tract.

**Specific target organ toxicity - repeated exposure**

No data available

**Aspiration hazard**

No data available

**Aroclor 1242****Acute toxicity**

LD50 Oral - Rat - 4,250 mg/kg

Remarks: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste): Eye: Chromodacryorrhea.

Diarrhea

Nutritional and Gross Metabolic: Weight loss or decreased weight gain.

Inhalation: No data available

Dermal: No data available

No data available

**Skin corrosion/irritation**

Remarks: No data available

**Serious eye damage/eye irritation**

Remarks: No data available

**Respiratory or skin sensitization**

No data available

**Germ cell mutagenicity**

No data available

**Carcinogenicity**

No data available

**Reproductive toxicity**

No data available

**Specific target organ toxicity - single exposure**

No data available

**Specific target organ toxicity - repeated exposure**

Causes damage to organs through prolonged or repeated exposure.

Remarks: No data available

**Aspiration hazard**

No data available

---

**SECTION 12: Ecological information****12.1 Toxicity****Mixture**

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 Endocrine disrupting properties**

No data available

**12.7 Other adverse effects**

No data available

**Components****Methanol**

|                                                     |                                                                                                          |
|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| Toxicity to fish                                    | flow-through test LC50 - <i>Lepomis macrochirus</i> (Bluegill) - 15,400.0 mg/l - 96 h (US-EPA)           |
| Toxicity to daphnia and other aquatic invertebrates | semi-static test EC50 - <i>Daphnia magna</i> (Water flea) - 18,260 mg/l - 96 h (OECD Test Guideline 202) |
| Toxicity to algae                                   | static test ErC50 - <i>Pseudokirchneriella subcapitata</i> (green algae) - ca. 22,000.0 mg/l - 96 h      |

|                                    |                                                                                                |
|------------------------------------|------------------------------------------------------------------------------------------------|
|                                    | (OECD Test Guideline 201)                                                                      |
| Toxicity to bacteria               | static test IC50 - activated sludge - > 1,000 mg/l - 3 h<br>(OECD Test Guideline 209)          |
| Toxicity to fish(Chronic toxicity) | NOEC - Oryzias latipes (Orange-red killifish) - 7,900 mg/l - 200 h<br>Remarks: (External MSDS) |

#### **Aroclor 1242**

|                                                                       |                                                                 |
|-----------------------------------------------------------------------|-----------------------------------------------------------------|
| Toxicity to fish                                                      | LC50 - Pimephales promelas (fathead minnow) - 0.015 mg/l - 96 h |
| Toxicity to daphnia and other aquatic invertebrates                   | LC50 - Daphnia magna (Water flea) - 0.23 mg/l - 48 h            |
| Toxicity to algae                                                     | LC50 - Algae - 0.006 mg/l - 28 h                                |
| Toxicity to fish(Chronic toxicity)                                    | LC50 - Lepomis macrochirus - 0.054 mg/l - 15 d                  |
| Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity) | LC50 - Daphnia magna (Water flea) - 0.067 mg/l - 21 d           |

---

## **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.

---

## **SECTION 14: Transport information**

#### **DOT (US)**

UN number: 1230 Class: 3 Packing group: II  
Proper shipping name: MethanolSOLUTION

Reportable Quantity (RQ): 5000 lbs  
Poison Inhalation Hazard: No

#### **IMDG**

UN number: 1230 Class: 3 (6.1) Packing group: II EMS-No: F-E, S-D  
Proper shipping name: METHANOLSOLUTION

#### **IATA**

UN number: 1230 Class: 3 (6.1) Packing group: II  
Proper shipping name: MethanolSOLUTION

---

## 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 |
|----------|---------|---------------|
| Methanol | 67-56-1 | 2007-07-01    |

### SARA 311/312 Hazards

Fire Hazard, Chronic Health Hazard

### Massachusetts Right To Know Components

|              | CAS-No.    | Revision Date |
|--------------|------------|---------------|
| Methanol     | 67-56-1    | 2007-07-01    |
| Aroclor 1242 | 53469-21-9 | 1993-02-16    |

### Pennsylvania Right To Know Components

|              | CAS-No.    | Revision Date |
|--------------|------------|---------------|
| Methanol     | 67-56-1    | 2007-07-01    |
| Aroclor 1242 | 53469-21-9 | 1993-02-16    |

### California Prop. 65 Components

, which is/are known to the State of California to cause cancer, and Aroclor 1242

| CAS-No.    | Revision Date |
|------------|---------------|
| 53469-21-9 | 2008-08-01    |

, which is/are known to the State of California to cause birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov). Methanol

| CAS-No. | Revision Date |
|---------|---------------|
| 67-56-1 | 2012-03-16    |



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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: 8.5

Revision Date: 02/07/2023

Print Date: 10/19/2023

## SAFETY DATA SHEET

Version 6.4  
Revision Date 02/07/2023  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Aroclor 1254

Product Number : 48586  
Brand : Supelco  
Index-No. : 602-039-00-4  
CAS-No. : 11097-69-1

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

Company : Sigma-Aldrich Inc.  
3050 SPRUCE ST  
ST. LOUIS MO 63103  
UNITED STATES

Telephone : +1 314 771-5765  
Fax : +1 800 325-5052

**1.4 Emergency telephone**

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-  
527-3887 CHEMTREC (International) 24  
Hours/day; 7 Days/week

**SECTION 2: Hazards identification****2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Acute toxicity, Oral (Category 4), H302  
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

Warning

|                            |                                                                             |
|----------------------------|-----------------------------------------------------------------------------|
| Hazard statement(s)        |                                                                             |
| H302                       | Harmful if swallowed.                                                       |
| H373                       | May cause damage to organs through prolonged or repeated exposure.          |
| H410                       | Very toxic to aquatic life with long lasting effects.                       |
| Precautionary statement(s) |                                                                             |
| P260                       | Do not breathe dust/ fume/ gas/ mist/ 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.                                           |
| P301 + P312 + P330         | IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth. |
| P314                       | Get medical advice/ attention if you feel unwell.                           |
| P391                       | Collect spillage.                                                           |
| P501                       | Dispose of contents/ container to an approved waste disposal plant.         |

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

CAS-No. : 11097-69-1  
Index-No. : 602-039-00-4

| Component           | Classification                                                                                                                                                                                                                                    | Concentration |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>Aroclor 1254</b> |                                                                                                                                                                                                                                                   |               |
|                     | Acute Tox. 4; STOT RE 2; Aquatic Acute 1; Aquatic Chronic 1; H302, H373, H400, H410<br>Concentration limits:<br>>= 0.005 %: STOT RE 2, H373; >= 0.005 %: STOT RE 2, H373;<br>M-Factor - Aquatic Acute: 1,000<br>M-Factor - Aquatic Chronic: 1,000 | <= 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**

After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

**SECTION 5: Firefighting measures****5.1 Extinguishing media****Unsuitable extinguishing media**

For this substance/mixture no limitations of extinguishing agents are given.

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

Nature of decomposition products not known.

**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**

Prevent fire extinguishing water from contaminating surface water or the ground water system.

---

**SECTION 6: Accidental release measures****6.1 Personal precautions, protective equipment and emergency procedures**

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.

For personal protection see section 8.

**6.2 Environmental precautions**

Do not let product enter drains.

**6.3 Methods and materials for containment and cleaning up**

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent material (e.g. Chemizorb® ). Dispose of properly. Clean up affected area.

**6.4 Reference to other sections**

For disposal see section 13.

## SECTION 7: Handling and storage

### 7.1 Precautions for safe handling

#### Advice on safe handling

Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

#### Hygiene measures

Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.

For precautions see section 2.2.

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

#### Storage conditions

Tightly closed.

#### Storage class

Storage class (TRGS 510): 10: Combustible liquids

### 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                                                                                   |
|--------------|------------|------------------------------------------------------------------------------------------------|-------------------------|-----------------------------------------------------------------------------------------|
| Aroclor 1254 | 11097-69-1 | 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. ACGIH Threshold Limit Values (TLV)                                                 |
|              |            | Confirmed animal carcinogen with unknown relevance to humans<br>Danger of cutaneous absorption |                         |                                                                                         |
|              |            | TWA                                                                                            | 0.5 mg/m <sup>3</sup>   | USA. Table Z-1-A Limits for Air Contaminants (1989 vacated values)                      |
|              |            | Skin notation                                                                                  |                         |                                                                                         |
|              |            | TWA                                                                                            | 0.001 mg/m <sup>3</sup> | USA. NIOSH Recommended Exposure Limits                                                  |
|              |            | Potential Occupational Carcinogen                                                              |                         |                                                                                         |
|              |            | 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

Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.

## Personal protective equipment

### Eye/face protection

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

### Skin protection

required

### Body Protection

protective clothing

### Respiratory protection

required when vapours/aerosols are generated.

Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

### Control of environmental exposure

Do not let product enter drains.

---

## SECTION 9: Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

|                                                 |                      |
|-------------------------------------------------|----------------------|
| a) Appearance                                   | Form: liquid         |
| b) Odor                                         | No data available    |
| c) Odor Threshold                               | No data available    |
| d) pH                                           | No data available    |
| e) Melting point/freezing point                 | No data available    |
| f) Initial boiling point and boiling range      | No data available    |
| g) Flash point                                  | ( )No data available |
| h) Evaporation rate                             | No data available    |
| i) Flammability (solid, gas)                    | No data available    |
| j) Upper/lower flammability or explosive limits | No data available    |
| k) Vapor pressure                               | No data available    |
| l) Vapor density                                | No data available    |
| m) 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                                 | No data available    |

- temperature
- |                              |                   |
|------------------------------|-------------------|
| q) Decomposition temperature | No data available |
| r) Viscosity                 | No data available |
| s) Explosive properties      | No data available |
| t) Oxidizing properties      | No data available |

## 9.2 Other safety information

No data available

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to avoid

no information available

### 10.5 Incompatible materials

Strong oxidizing agents

### 10.6 Hazardous decomposition products

In the event of fire: see section 5

---

## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

#### Acute toxicity

LD50 Oral - Rat - 1,010 mg/kg

Remarks: (RTECS)

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: 1 - Group 1: Carcinogenic to humans (Aroclor 1254)  
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.

**Aspiration hazard**

No data available

**11.2 Additional Information**

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 - Oncorhynchus mykiss (rainbow trout) - 0.22 µg/l - 96.0 h

Toxicity to algae LC50 - Algae - 0.015 mg/l - 28 h

Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity) LC50 - Daphnia magna (Water flea) - 0.001 mg/l - 21 d

**12.2 Persistence and degradability**

No data available

**12.3 Bioaccumulative potential**

Bioaccumulation Pimephales promelas (fathead minnow) - 8 Months  
- 1.8 µg/l(Aroclor 1254)

Bioconcentration factor (BCF): 238,000

**12.4 Mobility in soil**

No data available

**12.5 Results of PBT and vPvB assessment**

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

**12.6 Endocrine disrupting properties**

No data available



## 12.7 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.

---

## SECTION 14: Transport information

#### DOT (US)

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

#### IMDG

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

#### IATA

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

---

## 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

|              |                       |                             |
|--------------|-----------------------|-----------------------------|
| Aroclor 1254 | CAS-No.<br>11097-69-1 | Revision Date<br>1993-02-16 |
|--------------|-----------------------|-----------------------------|

#### Pennsylvania Right To Know Components

|              |                       |                             |
|--------------|-----------------------|-----------------------------|
| Aroclor 1254 | CAS-No.<br>11097-69-1 | Revision Date<br>1993-02-16 |
|--------------|-----------------------|-----------------------------|

**California Prop. 65 Components**

, which is/are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov). Aroclor 1254

CAS-No.  
11097-69-1

Revision Date  
2008-08-01

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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: 02/07/2023

Print Date: 10/07/2023

## SAFETY DATA SHEET

Version 6.10  
Revision Date 08/31/2023  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Pentachlorophenol

Product Number : P2604  
Brand : Aldrich  
Index-No. : 604-002-00-8  
CAS-No. : 87-86-5

**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, Inhalation (Category 2), H330  
Acute toxicity, Dermal (Category 3), H311  
Skin irritation (Category 2), H315  
Eye irritation (Category 2A), H319  
Carcinogenicity (Category 2), H351  
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335  
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.

H315

Causes skin irritation.

H319

Causes serious eye irritation.

H330

Fatal if inhaled.

H335

May cause respiratory irritation.

H351

Suspected of causing cancer.

H410

Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201

Obtain special instructions before use.

P202

Do not handle until all safety precautions have been read and understood.

P260

Do not breathe dust.

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.

P284

Wear respiratory 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 + P310

IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor.

P305 + P351 + P338

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

P308 + P313

IF exposed or concerned: Get medical advice/ attention.

P332 + P313

If skin irritation occurs: Get medical advice/ attention.

P337 + P313

If eye irritation persists: Get medical advice/ attention.

P362

Take off contaminated clothing and wash before reuse.

P391

Collect spillage.

P403 + P233

Store in a well-ventilated place. Keep container tightly closed.

P405

Store locked up.

P501

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

## 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

|                  |                                     |
|------------------|-------------------------------------|
| Formula          | : C <sub>6</sub> HCl <sub>5</sub> O |
| Molecular weight | : 266.34 g/mol                      |
| CAS-No.          | : 87-86-5                           |
| EC-No.           | : 201-778-6                         |
| Index-No.        | : 604-002-00-8                      |

| Component                | Classification                                                                                                                                                                                                                            | Concentration |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>Pentachlorophenol</b> | Acute Tox. 3; Acute Tox. 2; Acute Tox. 3; Skin Irrit. 2; Eye Irrit. 2A; Carc. 2; STOT SE 3; Aquatic Acute 1; Aquatic Chronic 1; H301, H330, H311, H315, H319, H351, H335, H400, H410<br>M-Factor - Aquatic Acute: 10 - 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

First aiders need to protect themselves. Show this material safety data sheet to the doctor in attendance.

#### If inhaled

After inhalation: fresh air. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

#### In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. 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                                                                                   |
|-------------------|---------|------------------------------------------------------------------------------------------------|-----------------------|-----------------------------------------------------------------------------------------|
| Pentachlorophenol | 87-86-5 | TWA                                                                                            | 0.5 mg/m <sup>3</sup> | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|                   | Remarks | Confirmed animal carcinogen with unknown relevance to humans<br>Danger of cutaneous absorption |                       |                                                                                         |
|                   |         | STEL                                                                                           | 1 mg/m <sup>3</sup>   | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|                   |         | Confirmed animal carcinogen with unknown relevance to humans<br>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<br>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                                                                                           |                       |                                                                                         |

#### Biological occupational exposure limits

| Component | CAS-No. | Parameters | Value | Biological specimen | Basis |
|-----------|---------|------------|-------|---------------------|-------|
|-----------|---------|------------|-------|---------------------|-------|

|                       |         |                                 |  |       |                                                    |
|-----------------------|---------|---------------------------------|--|-------|----------------------------------------------------|
| Pentachloropheno<br>l | 87-86-5 | pentachloro<br>phenol           |  | Urine | ACGIH -<br>Biological<br>Exposure Indices<br>(BEI) |
|                       | Remarks | Prior to last shift of workweek |  |       |                                                    |

## 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 EN 16523-1 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 Dermatrill® L

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: KCL 741 Dermatrill® L

#### Body Protection

protective clothing

#### Respiratory protection

Recommended Filter type: Filter type P3

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer.

These measures have to be properly documented.  
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: powder<br>Color: off-white                 |
| b) Odor                                         | No data available                                |
| c) Odor Threshold                               | No data available                                |
| d) pH                                           | No data available                                |
| e) Melting point/freezing point                 | Melting point/range: 165 - 180 °C (329 - 356 °F) |
| f) Initial boiling point and boiling range      | 310 °C 590 °F                                    |
| g) Flash point                                  | No data available                                |
| h) Evaporation rate                             | No data available                                |
| i) Flammability (solid, gas)                    | No data available                                |
| j) Upper/lower flammability or explosive limits | No data available                                |
| k) Vapor pressure                               | 0.00015 hPa at 25 °C (77 °F)                     |
| l) Vapor density                                | No data available                                |
| m) Density                                      | 1.978 g/mL at 25 °C (77 °F)                      |
| Relative density                                | No data available                                |
| n) Water solubility                             | 0.02 g/l at 30 °C (86 °F) - slightly soluble     |
| o) Partition coefficient: n-octanol/water       | log Pow: 5.12                                    |
| 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                                             |

### 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, 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 - 27 mg/kg

Remarks: Vascular:BP elevation not characterized in autonomic section.

Endocrine:Hyperglycemia.

Nutritional and Gross Metabolic:Changes in:Body temperature increase.

LC50 Inhalation - 4 h - 0.051 mg/l - dust/mist

LC50 Inhalation - Rat - 355 mg/m3 - dust/mist

Remarks: Behavioral:Excitement.

Behavioral:Muscle contraction or spasticity.

Lungs, Thorax, or Respiration:Dyspnea.

LD50 Dermal - Rat - 96.0 mg/kg

Remarks: Behavioral:Excitement.

Behavioral:Muscle contraction or spasticity.

Lungs, Thorax, or Respiration:Dyspnea.

No data available

#### Skin corrosion/irritation

Skin - Rabbit

Result: Open irritation test - 24.00 h

#### Serious eye damage/eye irritation

Eyes - Rabbit

Result: Mild eye irritation - 24.00 h

#### Respiratory or skin sensitization

No data available

#### Germ cell mutagenicity

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No data available

### **Carcinogenicity**

The evidence for carcinogenicity of pentachlorophenol (PCP) is based on assays that utilized less than pure PCP. Contaminants of PCP include: tri- or tetra- chlorophenol, hexachlorobenzene, polychlorinated dibenzo-p-dioxins, or polychlorinated dibenzofurans. Indications are that positive evidence for carcinogenicity is from the contaminant(s) and not the PCP. 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: 1 - Group 1: Carcinogenic to humans (Pentachlorophenol)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (Pentachlorophenol)

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

Overexposure may cause reproductive disorder(s) based on tests with laboratory animals.

### **Specific target organ toxicity - single exposure**

May cause respiratory irritation.

### **Specific target organ toxicity - repeated exposure**

No data available

### **Aspiration hazard**

No data available

## **11.2 Additional Information**

Convulsions

Kidney -

---

## **SECTION 12: Ecological information**

### **12.1 Toxicity**

|                                                     |                                                                                   |
|-----------------------------------------------------|-----------------------------------------------------------------------------------|
| Toxicity to fish                                    | LC50 - Cyprinodon variegatus (sheepshead minnow) - 0.16 - 0.5 mg/l - 96.0 h       |
|                                                     | LC50 - Carassius auratus (goldfish) - 0.16 - 0.38 mg/l - 96.0 h                   |
|                                                     | LC50 - Oncorhynchus mykiss (rainbow trout) - 0.075 mg/l - 96.0 h                  |
|                                                     | NOEC - other fish - 0.01 mg/l - 24.0 h                                            |
|                                                     | LOEC - other fish - 0.1 mg/l - 24.0 h                                             |
| Toxicity to daphnia and other aquatic invertebrates | EC50 - Daphnia magna (Water flea) - 0.30 - 1.30 mg/l - 48 h                       |
| Toxicity to algae                                   | EC50 - Chlorella vulgaris (Fresh water algae) - 10.30 mg/l - 96 h                 |
|                                                     | Growth inhibition EC50 - Scenedesmus quadricauda (Green algae) - 0.08 mg/l - 96 h |

|                                                                       |                                                                                   |
|-----------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Toxicity to fish(Chronic toxicity)                                    | Growth inhibition NOEC - Pimephales promelas (fathead minnow) - 0.056 mg/l - 28 d |
|                                                                       | Growth inhibition LOEC - Pimephales promelas (fathead minnow) - 0.056 mg/l - 28 d |
| Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity) | Growth inhibition LOEC - Daphnia magna (Water flea) - 0.56 mg/l - 21 d            |

## 12.2 Persistence and degradability

Biodegradability Result: - Not readily biodegradable.

## 12.3 Bioaccumulative potential

Bioaccumulation Oncorhynchus mykiss (rainbow trout) - 144 h - 0.0912 mg/l(Pentachlorophenol)

Bioconcentration factor (BCF): 482

## 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 Endocrine disrupting properties

No data available

## 12.7 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.

---

## SECTION 14: Transport information

### DOT (US)

UN number: 3155 Class: 6.1 Packing group: II  
 Proper shipping name: Pentachlorophenol  
 Reportable Quantity (RQ): 10 lbs  
 Reportable Quantity (RQ): 10 lbs  
 Reportable Quantity (RQ): 1 lbs  
 Marine pollutant: yes Poison Inhalation Hazard: No

### IMDG

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UN number: 3155    Class: 6.1    Packing group: II    EMS-No: F-A, S-A  
Proper shipping name: PENTACHLOROPHENOL  
Marine pollutant : yes  
Marine pollutant : yes

**IATA**

UN number: 3155    Class: 6.1    Packing group: II  
Proper shipping name: Pentachlorophenol

---

**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:

|                   |                    |                             |
|-------------------|--------------------|-----------------------------|
| Pentachlorophenol | CAS-No.<br>87-86-5 | Revision Date<br>2020-07-14 |
|-------------------|--------------------|-----------------------------|

**SARA 311/312 Hazards**

Acute Health Hazard, Chronic Health Hazard

:  
**Reportable Quantity**      D037 lbs  
F027 lbs

**Massachusetts Right To Know Components**

|                   |                    |                             |
|-------------------|--------------------|-----------------------------|
| Pentachlorophenol | CAS-No.<br>87-86-5 | Revision Date<br>2020-07-14 |
|-------------------|--------------------|-----------------------------|

**Pennsylvania Right To Know Components**

|                   |                    |                             |
|-------------------|--------------------|-----------------------------|
| Pentachlorophenol | CAS-No.<br>87-86-5 | Revision Date<br>2020-07-14 |
|-------------------|--------------------|-----------------------------|

**California Prop. 65 Components**

|                                                                                                                                                                                                    |                    |                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------|
| , which is/are known to the State of California to cause cancer. For more information go to <a href="http://www.P65Warnings.ca.gov.Pentachlorophenol">www.P65Warnings.ca.gov.Pentachlorophenol</a> | CAS-No.<br>87-86-5 | Revision Date<br>2007-09-28 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------|

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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

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Version: 6.10

Revision Date: 08/31/2023

Print Date: 10/07/2023

# Safety data sheet

acc. to Safe Work Australia - Code of Practice



## Perfluorooctane sulfonic acid ROTI®Star PFAS Standard

article number: **20TA**  
Version: **GHS 1.0 en**

date of compilation: 2023-03-27

## SECTION 1: Identification of the substance/mixture and of the company/undertaking

### 1.1 Product identifier

|                                 |                                                              |
|---------------------------------|--------------------------------------------------------------|
| Identification of the substance | <b>Perfluorooctane sulfonic acid ROTI®Star PFAS Standard</b> |
| Article number                  | 20TA                                                         |
| CAS number                      | 1763-23-1                                                    |
| Alternative name(s)             | PFAS                                                         |

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

|                           |                                                                                                               |
|---------------------------|---------------------------------------------------------------------------------------------------------------|
| Relevant identified uses: | Laboratory and analytical use<br>Laboratory chemical                                                          |
| Uses advised against:     | Do not use for products which come into contact with foodstuffs. Do not use for private purposes (household). |

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

Carl Roth GmbH + Co KG  
Schoemperlenstr. 3-5  
D-76185 Karlsruhe  
Germany

**Telephone:** +49 (0) 721 - 56 06 0

**Telefax:** +49 (0) 721 - 56 06 149

**e-mail:** [sicherheit@carlroth.de](mailto:sicherheit@carlroth.de)

**Website:** [www.carlroth.de](http://www.carlroth.de)

Competent person responsible for the safety data sheet: Department Health, Safety and Environment

**e-mail (competent person):** [sicherheit@carlroth.de](mailto:sicherheit@carlroth.de)

### 1.4 Emergency telephone number

| Name                                                 | Street          | Postal code/city   | Telephone | Website |
|------------------------------------------------------|-----------------|--------------------|-----------|---------|
| NSW Poisons Information Centre<br>Childrens Hospital | Hawkesbury Road | 2145 Westmead, NSW | 131126    |         |

## SECTION 2: Hazards identification

### 2.1 Classification of the substance or mixture

Classification acc. to GHS

| Section | Hazard class            | Cat-egory | Hazard class and category | Hazard statement |
|---------|-------------------------|-----------|---------------------------|------------------|
| 3.10    | Acute toxicity (oral)   | 4         | Acute Tox. 4              | H302             |
| 3.11    | Acute toxicity (inhal.) | 4         | Acute Tox. 4              | H332             |
| 3.6     | Carcinogenicity         | 2         | Carc. 2                   | H351             |
| 3.7     | Reproductive toxicity   | 1B        | Repr. 1B                  | H360D            |

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## Perfluorooctane sulfonic acid ROTI®Star PFAS Standard

article number: 20TA

| Section | Hazard class                                       | Cat-egory | Hazard class and category | Hazard statement |
|---------|----------------------------------------------------|-----------|---------------------------|------------------|
| 3.7L    | Effects on or via lactation                        | L         | Lact.                     | H362             |
| 3.9     | Specific target organ toxicity - repeated exposure | 1         | STOT RE 1                 | H372             |

For full text of abbreviations: see SECTION 16

### The most important adverse physicochemical, human health and environmental effects

Delayed or immediate effects can be expected after short or long-term exposure.

## 2.2 Label elements

### Labelling

#### Signal word

**Danger**

#### Pictograms

GHS07, GHS08



#### Hazard statements

|           |                                                                |
|-----------|----------------------------------------------------------------|
| H302+H332 | Harmful if swallowed or if inhaled                             |
| H351      | Suspected of causing cancer                                    |
| H360D     | May damage the unborn child                                    |
| H362      | May cause harm to breast-fed children                          |
| H372      | Causes damage to organs through prolonged or repeated exposure |

#### Precautionary statements

##### **Precautionary statements - prevention**

|      |                                                                           |
|------|---------------------------------------------------------------------------|
| P260 | Do not breathe dusts or mists                                             |
| P263 | Avoid contact during pregnancy/while nursing                              |
| P270 | Do not eat, drink or smoke when using this product                        |
| P280 | Wear protective gloves/protective clothing/eye protection/face protection |

##### **Precautionary statements - response**

|           |                                                                                                 |
|-----------|-------------------------------------------------------------------------------------------------|
| P304+P340 | IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing |
| P312      | Call a POISON CENTER or doctor/physician if you feel unwell                                     |
| P330      | Rinse mouth                                                                                     |

##### **Precautionary statements - disposal**

|      |                                                              |
|------|--------------------------------------------------------------|
| P501 | Dispose of contents/container to industrial combustion plant |
|------|--------------------------------------------------------------|

For professional users only



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## Perfluorooctane sulfonic acid ROTI®Star PFAS Standard

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### 2.3 Other hazards

#### Results of PBT and vPvB assessment

According to the results of its assessment, this substance is not a PBT or a vPvB.

#### Endocrine disrupting properties

Does not contain an endocrine disruptor (EDC) in a concentration of  $\geq 0,1\%$ .

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

|                   |                               |
|-------------------|-------------------------------|
| Name of substance | Perfluorooctane sulfonic acid |
| Molecular formula | $C_8HF_{17}O_3S$              |
| Molar mass        | 500.1 g/mol                   |
| CAS No            | 1763-23-1                     |

## SECTION 4: First aid measures

### 4.1 Description of first aid measures



#### General notes

Take off contaminated clothing.

#### Following inhalation

Provide fresh air. In all cases of doubt, or when symptoms persist, seek medical advice.

#### Following skin contact

Rinse skin with water/shower.

#### Following eye contact

Rinse cautiously with water for several minutes. In all cases of doubt, or when symptoms persist, seek medical advice.

#### Following ingestion

Rinse mouth with water (only if the person is conscious). In case of accident or unwellness, seek medical advice immediately (show directions for use or safety data sheet if possible). Call a doctor.

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

Vomiting, Nausea

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

none

## Perfluorooctane sulfonic acid ROTI®Star PFAS Standard

article number: 20TA

### SECTION 5: Firefighting measures

#### 5.1 Extinguishing media



##### Suitable extinguishing media

co-ordinate firefighting measures to the fire surroundings  
water, foam, dry extinguishing powder, ABC-powder

##### Unsuitable extinguishing media

water jet

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

Combustible.

##### Hazardous combustion products

In case of fire may be liberated: Carbon monoxide (CO), Carbon dioxide (CO<sub>2</sub>), Sulphur oxides (SO<sub>x</sub>)

#### 5.3 Advice for firefighters

In case of fire and/or explosion do not breathe fumes. Fight fire with normal precautions from a reasonable distance. Wear self-contained breathing apparatus.

### SECTION 6: Accidental release measures

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



##### For non-emergency personnel

Use personal protective equipment as required. Avoid contact with skin, eyes and clothes. Do not breathe dust.

#### 6.2 Environmental precautions

Keep away from drains, surface and ground water.

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

##### Advice on how to contain a spill

Covering of drains. Take up mechanically.

##### Advice on how to clean up a spill

Take up mechanically. Control of dust.

##### 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.

## Perfluorooctane sulfonic acid ROTI®Star PFAS Standard

article number: 20TA

### SECTION 7: Handling and storage

#### 7.1 Precautions for safe handling

Avoid exposure. Avoid dust formation.

##### Advice on general occupational hygiene

Wash hands before breaks and after work. Keep away from food, drink and animal feedingstuffs.

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

Store in a dry place. Keep in a cool place.

##### 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.

##### Specific designs for storage rooms or vessels

Recommended storage temperature: -20 °C

#### 7.3 Specific end use(s)

No information available.

### SECTION 8: Exposure controls/personal protection

#### 8.1 Control parameters

##### National limit values

##### Occupational exposure limit values (Workplace Exposure Limits)

This information is not available.

#### 8.2 Exposure controls

##### Individual protection measures (personal protective equipment)

##### Eye/face protection



Use safety goggle with side protection.

##### Skin protection



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## Perfluorooctane sulfonic acid ROTI®Star PFAS Standard

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### • hand protection

Wear suitable gloves. Chemical protection gloves are suitable, which are tested according to EN 374. For special purposes, it is recommended to check the resistance to chemicals of the protective gloves mentioned above together with the supplier of these gloves. The times are approximate values from measurements at 22 °C and permanent contact. Increased temperatures due to heated substances, body heat etc. and a reduction of the effective layer thickness by stretching can lead to a considerable reduction of the breakthrough time. If in doubt, contact manufacturer. At an approx. 1.5 times larger / smaller layer thickness, the respective breakthrough time is doubled / halved. The data apply only to the pure substance. When transferred to substance mixtures, they may only be considered as a guide.

### • type of material

NBR (Nitrile rubber)

### • material thickness

>0,11 mm

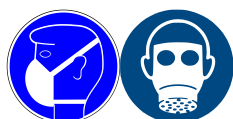
### • breakthrough times of the glove material

>480 minutes (permeation: level 6)

### • other protection measures

Take recovery periods for skin regeneration. Preventive skin protection (barrier creams/ointments) is recommended.

### Respiratory protection



Respiratory protection necessary at: Dust formation. Particulate filter device (EN 143). P2 (filters at least 94 % of airborne particles, colour code: White).

### Environmental exposure controls

Keep away from drains, surface and ground water.

## SECTION 9: Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

|                                                          |                                                           |
|----------------------------------------------------------|-----------------------------------------------------------|
| Physical state                                           | solid                                                     |
| Form                                                     | crystalline                                               |
| Colour                                                   | not determined                                            |
| Odour                                                    | characteristic                                            |
| Melting point/freezing point                             | 90 °C                                                     |
| Boiling point or initial boiling point and boiling range | 260 °C                                                    |
| Flammability                                             | this material is combustible, but will not ignite readily |
| Lower and upper explosion limit                          | not determined                                            |
| Flash point                                              | not applicable                                            |
| Auto-ignition temperature                                | not determined                                            |
| Decomposition temperature                                | not relevant                                              |

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|                                                     |                                                             |
|-----------------------------------------------------|-------------------------------------------------------------|
| pH (value)                                          | not applicable                                              |
| Kinematic viscosity                                 | not relevant                                                |
| <u>Solubility(ies)</u>                              |                                                             |
| Water solubility                                    | not determined                                              |
| <u>Partition coefficient</u>                        |                                                             |
| Partition coefficient n-octanol/water (log value):  | this information is not available                           |
| Vapour pressure                                     | not determined                                              |
| <u>Density and/or relative density</u>              |                                                             |
| Density                                             | not determined                                              |
| Relative vapour density                             | information on this property is not available               |
| Particle characteristics                            | No data available.                                          |
| <u>Other safety parameters</u>                      |                                                             |
| Oxidising properties                                | none                                                        |
| <b>9.2 Other information</b>                        |                                                             |
| Information with regard to physical hazard classes: | hazard classes acc. to GHS (physical hazards): not relevant |
| Other safety characteristics:                       | There is no additional information.                         |

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

The product in the delivered form is not dust explosion capable; the enrichment of fine dust however leads to the danger of dust explosion.

### 10.2 Chemical stability

The material is stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

### 10.3 Possibility of hazardous reactions

**Violent reaction with:** strong oxidiser

### 10.4 Conditions to avoid

There are no specific conditions known which have to be avoided.

### 10.5 Incompatible materials

There is no additional information.

### 10.6 Hazardous decomposition products

Hazardous combustion products: see section 5.

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### SECTION 11: Toxicological information

#### 11.1 Information on toxicological effects

##### Classification acc. to GHS

##### Acute toxicity

Harmful if swallowed. Harmful if inhaled.

##### Skin corrosion/irritation

Shall not be classified as corrosive/irritant to skin.

##### Serious eye damage/eye irritation

Shall not be classified as seriously damaging to the eye or eye irritant.

##### Respiratory or skin sensitisation

Shall not be classified as a respiratory or skin sensitiser.

##### Germ cell mutagenicity

Shall not be classified as germ cell mutagenic.

##### Carcinogenicity

Suspected of causing cancer.

##### Reproductive toxicity

May damage the unborn child. May cause harm to breast-fed children.

##### Specific target organ toxicity - single exposure

Shall not be classified as a specific target organ toxicant (single exposure).

##### Specific target organ toxicity - repeated exposure

Causes damage to organs through prolonged or repeated exposure.

##### Aspiration hazard

Shall not be classified as presenting an aspiration hazard.

#### Symptoms related to the physical, chemical and toxicological characteristics

##### • If swallowed

vomiting, nausea

##### • If in eyes

Data are not available.

##### • If inhaled

Data are not available.

##### • If on skin

Data are not available.

##### • Other information

This information is based upon the present state of our knowledge. Substance not yet fully tested.

#### 11.2 Endocrine disrupting properties

Does not contain an endocrine disruptor (EDC) in a concentration of  $\geq 0,1\%$ .

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## Perfluorooctane sulfonic acid ROTI®Star PFAS Standard

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### SECTION 12: Ecological information

#### 12.1 Toxicity

Toxic to aquatic life with long lasting effects.

#### 12.2 Persistence and degradability

Data are not available.

#### 12.3 Bioaccumulative potential

Data are not available.

#### 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 Endocrine disrupting properties

Does not contain an endocrine disruptor (EDC) in a concentration of  $\geq 0,1\%$ .

#### 12.7 Other adverse effects

Data are not available.

### SECTION 13: Disposal considerations

#### 13.1 Waste treatment methods



This material and its container must be disposed of as hazardous waste. Dispose of contents/container in accordance with local/regional/national/international regulations.

##### Sewage disposal-relevant information

Do not empty into drains.

##### Waste treatment of containers/packagings

Only packagings which are approved (e.g. acc. to the Dangerous Goods Regulations) may be used.

##### Relevant provisions relating to waste(Basel Convention)

##### Properties of waste which render it hazardous

**H11** Toxic (Delayed or chronic)

#### 13.3 Remarks

Waste shall be separated into the categories that can be handled separately by the local or national waste management facilities. Please consider the relevant national or regional provisions.

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### SECTION 14: Transport information

#### 14.1 UN number

|           |            |
|-----------|------------|
| UN RTDG   | UN<br>3077 |
| IMDG-Code | UN 3077    |
| ICAO-TI   | UN 3077    |

#### 14.2 UN proper shipping name

|                |                                                       |
|----------------|-------------------------------------------------------|
| UN RTDG        | ENVIRONMENTALLY HAZARDOUS SUBSTANCE,<br>SOLID, N.O.S. |
| IMDG-Code      | ENVIRONMENTALLY HAZARDOUS SUBSTANCE,<br>SOLID, N.O.S. |
| ICAO-TI        | Environmentally hazardous substance, solid,<br>n.o.s. |
| Technical name | Perfluorooctane sulfonic acid                         |

#### 14.3 Transport hazard class(es)

|           |   |
|-----------|---|
| UN RTDG   | 9 |
| IMDG-Code | 9 |
| ICAO-TI   | 9 |

#### 14.4 Packing group

|           |     |
|-----------|-----|
| UN RTDG   | III |
| IMDG-Code | III |
| ICAO-TI   | III |

#### 14.5 Environmental hazards

hazardous to the aquatic environment

#### 14.6 Special precautions for user

There is no additional information.

#### 14.7 Transport in bulk according to IMO instruments

The cargo is not intended to be carried in bulk.

#### 14.8 Information for each of the UN Model Regulations

##### Transport informationNational regulationsAdditional information(UN RTDG)

|                       |                                             |
|-----------------------|---------------------------------------------|
| UN number             | 3077                                        |
| Class                 | 9                                           |
| Environmental hazards | Yes<br>Hazardous to the aquatic environment |
| Packing group         | III                                         |
| Danger label(s)       | 9<br>Fish and tree                          |





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|                                                                                                                                                                         |                                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| <b>Special provisions (SP)</b>                                                                                                                                          | 274, 331, 335, 375<br>UN RTDG                                                                       |
| <b>Excepted quantities (EQ)</b>                                                                                                                                         | E1<br>UN RTDG                                                                                       |
| <b>Limited quantities (LQ)</b>                                                                                                                                          | 5 kg<br>UN RTDG                                                                                     |
| <b>Emergency Action Code</b>                                                                                                                                            | 2Z                                                                                                  |
| <b>International Maritime Dangerous Goods Code (IMDG) - Additional information</b>                                                                                      |                                                                                                     |
| Proper shipping name                                                                                                                                                    | ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.                                                  |
| Particulars in the shipper's declaration                                                                                                                                | UN3077, ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S., (Perfluorooctane sulfonic acid), 9, III |
| Marine pollutant                                                                                                                                                        | yes (hazardous to the aquatic environment), (Perfluorooctane sulfonic acid)                         |
| Danger label(s)                                                                                                                                                         | 9, "Fish and tree"                                                                                  |
|     |                                                                                                     |
| Special provisions (SP)                                                                                                                                                 | 274, 335, 966, 967, 969                                                                             |
| Excepted quantities (EQ)                                                                                                                                                | E1                                                                                                  |
| Limited quantities (LQ)                                                                                                                                                 | 5 kg                                                                                                |
| EmS                                                                                                                                                                     | F-A, S-F                                                                                            |
| Stowage category                                                                                                                                                        | A                                                                                                   |
| <b>International Civil Aviation Organization (ICAO-IATA/DGR) - Additional information</b>                                                                               |                                                                                                     |
| Proper shipping name                                                                                                                                                    | Environmentally hazardous substance, solid, n.o.s.                                                  |
| Particulars in the shipper's declaration                                                                                                                                | UN3077, Environmentally hazardous substance, solid, n.o.s., (Perfluorooctane sulfonic acid), 9, III |
| Environmental hazards                                                                                                                                                   | yes (hazardous to the aquatic environment)                                                          |
| Danger label(s)                                                                                                                                                         | 9, "Fish and tree"                                                                                  |
|   |                                                                                                     |
| Special provisions (SP)                                                                                                                                                 | A97, A158, A179, A197, A215                                                                         |
| Excepted quantities (EQ)                                                                                                                                                | E1                                                                                                  |
| Limited quantities (LQ)                                                                                                                                                 | 30 kg                                                                                               |

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### SECTION 15: Regulatory information

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

There is no additional information.

#### Other information

Directive 94/33/EC on the protection of young people at work. Observe employment restrictions under the Maternity Protection Directive (92/85/EEC) for expectant or nursing mothers.

#### National inventories

| Country | Inventory | Status                          |
|---------|-----------|---------------------------------|
| CN      | IECSC     | substance is listed             |
| EU      | ECSI      | substance is listed             |
| JP      | CSCL-ENCS | substance is listed             |
| KR      | KECI      | substance is listed             |
| MX      | INSQ      | substance is listed             |
| TW      | TCSI      | substance is listed             |
| US      | TSCA      | substance is listed as "ACTIVE" |

#### Legend

|           |                                                                         |
|-----------|-------------------------------------------------------------------------|
| CSCL-ENCS | List of Existing and New Chemical Substances (CSCL-ENCS)                |
| 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                                      |
| TCSI      | Taiwan Chemical Substance Inventory                                     |
| TSCA      | Toxic Substance Control Act                                             |

#### 15.2 Chemical Safety Assessment

No Chemical Safety Assessment has been carried out for this substance.

### SECTION 16: Other information

#### Abbreviations and acronyms

| Abbr.    | Descriptions of used abbreviations                                                                        |
|----------|-----------------------------------------------------------------------------------------------------------|
| CAS      | Chemical Abstracts Service (service that maintains the most comprehensive list of chemical substances)    |
| DGR      | Dangerous Goods Regulations (see IATA/DGR)                                                                |
| 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                                                                 |
| ICAO-TI  | Technical instructions for the safe transport of dangerous goods by air                                   |
| IMDG     | International Maritime Dangerous Goods Code                                                               |

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| Abbr.     | Descriptions of used abbreviations                    |
|-----------|-------------------------------------------------------|
| IMDG-Code | International Maritime Dangerous Goods Code           |
| NLP       | No-Longer Polymer                                     |
| PBT       | Persistent, Bioaccumulative and Toxic                 |
| UN RTDG   | UN Recommendations on the Transport of Dangerous Good |
| vPvB      | Very Persistent and very Bioaccumulative              |

### Key literature references and sources for data

Safe Work Australia's Code of Practice for Labelling of Workplace Hazardous Chemicals (under WHS Regulations).

UN Recommendations on the Transport of Dangerous Good. International Maritime Dangerous Goods Code (IMDG). Dangerous Goods Regulations (DGR) for the air transport (IATA).

### List of relevant phrases (code and full text as stated in section 2 and 3)

| Code  | Text                                                            |
|-------|-----------------------------------------------------------------|
| H302  | Harmful if swallowed.                                           |
| H332  | Harmful if inhaled.                                             |
| H351  | Suspected of causing cancer.                                    |
| H360D | May damage the unborn child.                                    |
| H362  | May cause harm to breast-fed children.                          |
| H372  | Causes damage to organs through prolonged or repeated exposure. |

### Disclaimer

This information is based upon the present state of our knowledge. This SDS has been compiled and is solely intended for this product.

## SAFETY DATA SHEET

Version 6.15  
Revision Date 08/23/2023  
Print Date 08/23/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Pyridine

Product Number : 270970  
Brand : Sigma-Aldrich  
Index-No. : 613-002-00-7  
CAS-No. : 110-86-1

**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)**

Flammable liquids (Category 2), H225  
Acute toxicity, Oral (Category 4), H302  
Acute toxicity, Inhalation (Category 4), H332  
Acute toxicity, Dermal (Category 4), H312  
Skin irritation (Category 2), H315  
Eye irritation (Category 2A), H319

For the full text of the H-Statements mentioned in this Section, see Section 16.

**2.2 GHS Label elements, including precautionary statements**

Pictogram



Signal Word

Danger

Hazard statement(s)

H225

Highly flammable liquid and vapor.

H302 + H312 + H332

Harmful if swallowed, in contact with skin or if inhaled.

H315

Causes skin irritation.

H319

Causes serious eye irritation.

Precautionary statement(s)

P210

Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.

P233

Keep container tightly closed.

P240

Ground/bond container and receiving equipment.

P241

Use explosion-proof electrical/ ventilating/ lighting/ equipment.

P242

Use only non-sparking tools.

P243

Take precautionary measures against static discharge.

P261

Avoid breathing mist or vapors.

P264

Wash skin thoroughly after handling.

P270

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

P271

Use only outdoors or in a well-ventilated area.

P280

Wear protective gloves/ eye protection/ face protection.

P301 + P312 + P330

IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth.

P303 + P361 + P353

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

P304 + P340 + P312

IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.

P305 + P351 + P338

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

P332 + P313

If skin irritation occurs: Get medical advice/ attention.

P337 + P313

If eye irritation persists: Get medical advice/ attention.

P362

Take off contaminated clothing and wash before reuse.

P370 + P378

In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.

P403 + P235

Store in a well-ventilated place. Keep cool.

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>5</sub> H <sub>5</sub> N |
| Molecular weight | : | 79.10 g/mol                     |
| CAS-No.          | : | 110-86-1                        |
| EC-No.           | : | 203-809-9                       |
| Index-No.        | : | 613-002-00-7                    |

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| Component       | Classification                                                                                        | Concentration |
|-----------------|-------------------------------------------------------------------------------------------------------|---------------|
| <b>Pyridine</b> |                                                                                                       |               |
|                 | Flam. Liq. 2; Acute Tox. 4;<br>Skin Irrit. 2; Eye Irrit. 2A;<br>H225, H302, H332, H312,<br>H315, H319 | <= 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. If breathing stops: mouth-to-mouth breathing or artificial respiration. Oxygen if necessary. Immediately 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

After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

#### Suitable extinguishing media

Small (incipient) fires must be extinguished with alcohol resistant foam, dry chemical powder or carbon dioxide. Large amounts of water are ineffective. Cool containers with large amounts of water.

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

Carbon oxides

Nitrogen oxides (NO<sub>x</sub>)

Combustible.

Pay attention to flashback.

Vapors are heavier than air and may spread along floors.  
Development of hazardous combustion gases or vapours possible in the event of fire.  
Forms explosive mixtures with air at ambient temperatures.

### **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. Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

---

## **SECTION 6: Accidental release measures**

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

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. 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. Risk of explosion.

### **6.3 Methods and materials for containment and cleaning up**

Large spills should be collected mechanically (remove by pumping) for disposal. Ventilate the area. Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent material (e.g. Chemizorb® ). Dispose of properly. Clean up affected area.

### **6.4 Reference to other sections**

For disposal see section 13.

---

## **SECTION 7: Handling and storage**

### **7.1 Precautions for safe handling**

#### **Advice on safe handling**

Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

#### **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**

Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition.

Handle and store under inert gas.

### Storage class

Storage class (TRGS 510): 3: Flammable liquids

### 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                                                                                   |
|-----------|----------|--------------------------------------------------------------|-------------------------------|-----------------------------------------------------------------------------------------|
| Pyridine  | 110-86-1 | TWA                                                          | 1 ppm                         | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|           | Remarks  | Confirmed animal carcinogen with unknown relevance to humans |                               |                                                                                         |
|           |          | TWA                                                          | 5 ppm<br>15 mg/m <sup>3</sup> | USA. NIOSH Recommended Exposure Limits                                                  |
|           |          | TWA                                                          | 5 ppm<br>15 mg/m <sup>3</sup> | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|           |          | PEL                                                          | 5 ppm<br>15 mg/m <sup>3</sup> | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |

### 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

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 EN 16523-1 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: butyl-rubber

Minimum layer thickness: 0.7 mm

Break through time: 240 min

Material tested: Butoject® (KCL 898)

##### Body Protection

Flame retardant antistatic protective clothing.



### Respiratory protection

Recommended Filter type: Filter A (acc. to DIN 3181) for vapours of organic compounds

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer.

These measures have to be properly documented.

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. Risk of explosion.

---

## SECTION 9: Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

|                                                 |                                                                              |
|-------------------------------------------------|------------------------------------------------------------------------------|
| a) Appearance                                   | Form: liquid<br>Color: colorless                                             |
| b) Odor                                         | pungent                                                                      |
| c) Odor Threshold                               | 0.0001 ppm                                                                   |
| d) pH                                           | ca.8.81 at 20 °C (68 °F)                                                     |
| e) Melting point/freezing point                 | Melting point/range: -42 °C (-44 °F) - lit.                                  |
| f) Initial boiling point and boiling range      | 115 °C 239 °F - lit.                                                         |
| g) Flash point                                  | 20 °C (68 °F) - closed cup - ISO 1523                                        |
| h) Evaporation rate                             | 12.7                                                                         |
| i) Flammability (solid, gas)                    | No data available                                                            |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 12.4 %(V)<br>Lower explosion limit: 1.8 %(V)          |
| k) Vapor pressure                               | ca.26.7 hPa at 25 °C (77 °F)                                                 |
| l) Vapor density                                | 2.73                                                                         |
| m) Density                                      | 0.978 g/cm <sup>3</sup> at 25 °C (77 °F) - lit.                              |
| Relative density                                | No data available                                                            |
| n) Water solubility                             | ca.1,000 g/l at 20 °C (68 °F)soluble                                         |
| o) Partition coefficient: n-octanol/water       | log Pow: ca.0.64 at 20 °C (68 °F) - (Lit.), Bioaccumulation is not expected. |
| p) Autoignition temperature                     | 900 °C (1652 °F) at 1,013 hPa                                                |
| q) Decomposition temperature                    | ca.490 °C (ca.914 °F) -                                                      |

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- r) Viscosity No data available  
s) Explosive properties No data available  
t) Oxidizing properties none

## 9.2 Other safety information

|                              |                                                                                  |
|------------------------------|----------------------------------------------------------------------------------|
| Solubility in other solvents | Diethyl ether at 20 °C (68 °F) - miscible<br>Ethanol at 20 °C (68 °F) - miscible |
| Surface tension              | 36.56 mN/m at 25 °C (77 °F)                                                      |
| Dissociation constant        | 5.25 at 25 °C (77 °F)                                                            |
| Relative vapor density       | 2.73                                                                             |

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

Vapors may form explosive mixture with air.

### 10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

### 10.3 Possibility of hazardous reactions

Risk of explosion with:

perchloric acid

nitrogen oxides

halogen-halogen compounds

Risk of ignition or formation of inflammable gases or vapours with:

chlorosulfonic acid

chromium(VI) oxide

Acid anhydrides

fuming sulfuric acid

Oxidizing agents

perchromates

Nitric acid

nitrogen dioxide

Exothermic reaction with:

Fluorine

sulfuric acid

silver perchlorate

### 10.4 Conditions to avoid

Warming.

### 10.5 Incompatible materials

rubber, various plastics, various metals

### 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 - 1,500 mg/kg

Remarks: (ECHA)

Symptoms: Vomiting, Nausea

LC50 Inhalation - Rat - male - 4 h - 17.1 mg/l - vapor

(US-EPA)

Symptoms: mucosal irritations, Cough, Shortness of breath

LD50 Dermal - Rabbit - > 1,000 - 2,000 mg/kg

(OECD Test Guideline 402)

No data available

#### Skin corrosion/irritation

Skin - Rabbit

Result: Mild skin irritation - 24 h

(Draize Test)

#### Serious eye damage/eye irritation

Eyes - Rabbit

Result: Irritating to eyes. - 24 h

Remarks: (ECHA)

#### Respiratory or skin sensitization

Local lymph node assay (LLNA) - Mouse

Result: negative

(OECD Test Guideline 429)

#### Germ cell mutagenicity

Test Type: Ames test

Test system: Salmonella typhimurium

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 471

Result: negative

Test Type: In vitro mammalian cell gene mutation test

Test system: Chinese hamster lung cells

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 476

Result: negative

Test Type: Micronucleus test

Species: Mouse

Cell type: Bone marrow

Application Route: Intraperitoneal injection

Method: OECD Test Guideline 475

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

**Specific target organ toxicity - repeated exposure**

No data available

**Aspiration hazard**

No data available

**11.2 Additional Information**

Repeated dose toxicity - Rat - male and female - Oral - 102 Weeks - NOAEL (No observed adverse effect level) - 7 mg/kg

RTECS: UR8400000

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, Dizziness, tachycardia, nervousness, insomnia, Skin disorders, loss of appetite  
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Systemic effects:

After uptake:

Headache

In high doses:

narcosis  
cardiovascular disorders  
Circulatory collapse

Chronic uptake results in damage of:

Liver  
Kidney

Good warning effect due to low odour threshold.

Other dangerous properties can not be excluded.

Handle in accordance with good industrial hygiene and safety practice.

---

## SECTION 12: Ecological information

### 12.1 Toxicity

|                                                     |                                                                                                                                                      |
|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Toxicity to fish                                    | semi-static test EC50 - Danio rerio (zebra fish) - 560 - 1,000 mg/l - 96 h<br>(OECD Test Guideline 203)<br>Remarks: (in analogy to similar products) |
| Toxicity to daphnia and other aquatic invertebrates | EC50 - Daphnia magna (Water flea) - 320 mg/l - 48 h<br>(OECD Test Guideline 202)<br>Remarks: (in analogy to similar products)                        |
| Toxicity to algae                                   | static test EC50 - Pseudokirchneriella subcapitata - 320 mg/l - 72 h<br>(OECD Test Guideline 201)<br>Remarks: (in analogy to similar products)       |

### 12.2 Persistence and degradability

|                  |                                                                                                     |
|------------------|-----------------------------------------------------------------------------------------------------|
| Biodegradability | aerobic - Exposure time 28 d<br>Result: 97 % - Readily biodegradable.<br>(OECD Test Guideline 301B) |
|------------------|-----------------------------------------------------------------------------------------------------|

### 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 Endocrine disrupting properties

No data available

### 12.7 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.

---

## SECTION 14: Transport information

### DOT (US)

Sigma-Aldrich - 270970

Page 10 of 12

UN number: 1282    Class: 3    Packing group: II  
Proper shipping name: Pyridine  
Reportable Quantity (RQ): 1000 lbs  
Reportable Quantity (RQ): 100 lbs  
Reportable Quantity (RQ): 1000 lbs  
Poison Inhalation Hazard: No

#### **IMDG**

UN number: 1282    Class: 3    Packing group: II    EMS-No: F-E, S-D  
Proper shipping name: PYRIDINE

#### **IATA**

UN number: 1282    Class: 3    Packing group: II  
Proper shipping name: Pyridine

---

### **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 |
|----------|----------|---------------|
| Pyridine | 110-86-1 | 2021-01-12    |

#### **SARA 311/312 Hazards**

Fire Hazard, Acute Health Hazard

:  
**Reportable Quantity**    F005 lbs  
D038 lbs

#### **Massachusetts Right To Know Components**

|          | CAS-No.  | Revision Date |
|----------|----------|---------------|
| Pyridine | 110-86-1 | 2021-01-12    |

#### **Pennsylvania Right To Know Components**

|          | CAS-No.  | Revision Date |
|----------|----------|---------------|
| Pyridine | 110-86-1 | 2021-01-12    |

#### **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/Pyridine">www.P65Warnings.ca.gov/Pyridine</a> | 110-86-1 | 2007-09-28    |

---

## 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: 6.15

Revision Date: 08/23/2023

Print Date: 08/23/2023

## SAFETY DATA SHEET

Version 6.8  
Revision Date 01/26/2023  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Selenium

Product Number : 209651

Brand : Aldrich

Index-No. : 034-001-00-2

CAS-No. : 7782-49-2

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

Company : Sigma-Aldrich Inc.  
3050 SPRUCE ST  
ST. LOUIS MO 63103  
UNITED STATES

Telephone : +1 314 771-5765

Fax : +1 800 325-5052

**1.4 Emergency telephone**

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 3), H331

Specific target organ toxicity - repeated exposure (Category 2), H373

Long-term (chronic) aquatic hazard (Category 4), H413

For the full text of the H-Statements mentioned in this Section, see Section 16.

**2.2 GHS Label elements, including precautionary statements**

Pictogram



Signal Word

Danger



|                            |                                                                                                          |
|----------------------------|----------------------------------------------------------------------------------------------------------|
| Hazard statement(s)        |                                                                                                          |
| H301 + H331                | Toxic if swallowed or if inhaled.                                                                        |
| H373                       | May cause damage to organs through prolonged or repeated exposure.                                       |
| H413                       | May cause long lasting harmful effects to aquatic life.                                                  |
| Precautionary statement(s) |                                                                                                          |
| P260                       | Do not breathe dust.                                                                                     |
| P264                       | Wash skin thoroughly after handling.                                                                     |
| P270                       | Do not eat, drink or smoke when using this product.                                                      |
| P271                       | Use only outdoors or in a well-ventilated area.                                                          |
| P273                       | Avoid release to the environment.                                                                        |
| P301 + P310 + P330         | IF SWALLOWED: Immediately call a POISON CENTER/ doctor.<br>Rinse mouth.                                  |
| P304 + P340 + P311         | IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor. |
| P314                       | Get medical advice/ attention if you feel unwell.                                                        |
| P403 + P233                | Store in a well-ventilated place. Keep container tightly closed.                                         |
| P405                       | Store locked up.                                                                                         |
| P501                       | Dispose of contents/ container to an approved waste disposal plant.                                      |

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

|                  |                |
|------------------|----------------|
| Formula          | : Se           |
| Molecular weight | : 78.96 g/mol  |
| CAS-No.          | : 7782-49-2    |
| EC-No.           | : 231-957-4    |
| Index-No.        | : 034-001-00-2 |

| Component       | Classification                                                           | Concentration |
|-----------------|--------------------------------------------------------------------------|---------------|
| <b>Selenium</b> |                                                                          |               |
|                 | Acute Tox. 3; STOT RE 2;<br>Aquatic Chronic 4; H301,<br>H331, H373, H413 | <= 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. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

**In case of skin contact**

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

**In case of eye contact**

After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

**If swallowed**

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**

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

**Unsuitable extinguishing media**

For this substance/mixture no limitations of extinguishing agents are given.

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

Selenium/selenium oxides

Not combustible.

Ambient fire may liberate hazardous vapours.

**5.3 Advice for firefighters**

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

**5.4 Further information**

Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

---

**SECTION 6: Accidental release measures****6.1 Personal precautions, protective equipment and emergency procedures**

Advice for non-emergency personnel: 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**

Change contaminated clothing. Preventive skin protection recommended. Wash hands 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.

Store under inert gas.

#### **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                                                                                   |
|-----------|-----------|-------|--------------------|-----------------------------------------------------------------------------------------|
| Selenium  | 7782-49-2 | TWA   | 0.2 mg/m3          | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|           |           | TWA   | 0.2 mg/m3          | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|           |           | TWA   | 0.2 mg/m3          | USA. Table Z-1-A Limits for Air Contaminants (1989 vacated values)                      |
|           |           | TWA   | 0.2 mg/m3          | USA. NIOSH Recommended Exposure Limits                                                  |
|           |           | PEL   | 0.2 mg/m3          | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |

## 8.2 Exposure controls

### Appropriate engineering controls

Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.

### Personal protective equipment

#### Eye/face protection

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

#### 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: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: KCL 741 Dermatril® L

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: 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: powder<br>Color: light gray                                                           |
| b) Odor                                         | No data available                                                                           |
| c) Odor Threshold                               | No data available                                                                           |
| d) pH                                           | No data available                                                                           |
| e) Melting point/freezing point                 | Melting point/range: 217 °C (423 °F) - lit.                                                 |
| f) Initial boiling point and boiling range      | 684.9 °C 1264.8 °F - lit.                                                                   |
| g) Flash point                                  | ( )Not applicable                                                                           |
| h) Evaporation rate                             | No data available                                                                           |
| i) Flammability (solid, gas)                    | No data available                                                                           |
| j) Upper/lower flammability or explosive limits | No data available                                                                           |
| k) Vapor pressure                               | > 0.001 hPa at 20 °C (68 °F)                                                                |
| l) Vapor density                                | No data available                                                                           |
| m) Density                                      | 4.81 g/cm <sup>3</sup> at 25 °C (77 °F) - lit.                                              |
| Relative density                                | 4.825 °C                                                                                    |
| n) Water solubility                             | 0.1 g/l at 20.9 °C (69.6 °F) - insoluble                                                    |
| o) Partition coefficient: n-octanol/water       | log Pow: 5Not applicable for inorganic substances                                           |
| p) Autoignition temperature                     | 220 - 250 °C (428 - 482 °F) at 1,013.25 hPa - Relative self-ignition temperature for solids |
| q) Decomposition temperature                    | No data available                                                                           |
| r) Viscosity                                    | No data available                                                                           |
| s) Explosive properties                         | No data available                                                                           |
| t) Oxidizing properties                         | none                                                                                        |

### **9.2 Other safety information**

No data available

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

### 10.3 Possibility of hazardous reactions

Risk of explosion with:

alkali amides

Metals

Oxygen

amides

cadmium

Potassium

sodium

nitrogen oxides

Tin

nitrogen trichloride

Risk of ignition or formation of inflammable gases or vapours with:

carbides

peroxi compounds

halogen-halogen compounds

halogen oxides

Fluorine

lithium silicide

barium peroxide

Uranium

Generates dangerous gases or fumes in contact with:

hydrochloric acid

sulfuric acid

Exothermic reaction with:

powdered aluminium

Beryllium

bromates

chromium(VI) oxide

chlorates

Nickel

Oxidizing agents

phosphorus

platinum

Nitric acid

silver oxide

Zinc

Alkali metals

### 10.4 Conditions to avoid

no information available

### 10.5 Incompatible materials

No data available

## 10.6 Hazardous decomposition products

In the event of fire: see section 5

---

## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

#### Acute toxicity

Acute toxicity estimate Oral - Expert judgment - 100.1 mg/kg

Symptoms: Gastrointestinal disturbance

Acute toxicity estimate Inhalation - Expert judgment - 4 h - 0.51 mg/l - dust/mist

Dermal: No data available

No data available

#### Skin corrosion/irritation

Skin - reconstructed human epidermis (RhE)

Result: No skin irritation

(OECD Test Guideline 431)

#### Serious eye damage/eye irritation

Eyes - Bovine cornea

Result: No eye irritation - 4 h

(OECD Test Guideline 437)

#### Respiratory or skin sensitization

Local lymph node assay (LLNA) - Mouse

Result: negative

(OECD Test Guideline 429)

#### Germ cell mutagenicity

Test Type: Ames test

Test system: Salmonella typhimurium

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 471

Result: negative

Test Type: Chromosome aberration test

Species: Mouse

Cell type: Bone marrow

Application Route: Intraperitoneal

Result: negative

Remarks: (ECHA)

#### 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

**Specific target organ toxicity - single exposure**

No data available

**Specific target organ toxicity - repeated exposure**

May cause damage to organs through prolonged or repeated exposure.

**Aspiration hazard**

No data available

**11.2 Additional Information**

Repeated dose toxicity - Rat - male and female - Oral - 13 Weeks - NOAEL (No observed adverse effect level) - 0.4 mg/kg

Remarks: (in analogy to similar products)

The value is given in analogy to the following substances: Sodium selenite

RTECS: VS7700000

anemia, Vomiting, Diarrhea, Cough, Difficulty in breathing, Acute selenium poisoning produces central nervous system effects, which include nervousness, convulsions, and drowsiness. Other signs of intoxication can include skin eruptions, lassitude, gastrointestinal distress, teeth that are discolored or decayed, odorous ("garlic") breath, and partial loss of hair and nails. Chronic exposure by inhalation can produce symptoms that include pallor, coating of the tongue, anemia, irritation of the mucosa, lumbar pain, liver and spleen damage, as well as any of the other previously mentioned symptoms. Chronic contact with selenium compounds may cause garlic odor of breath and sweat, dermatitis, and moderate emotional instability., Dermatitis, garlic-like breath odor, pallor, nervousness, depression

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

After absorption:

CNS disorders

Dizziness

muscular weakness

Headache

cardiovascular disorders

Shortness of breath

somnolence

Cough

Unconsciousness

Other dangerous properties can not be excluded.

Handle in accordance with good industrial hygiene and safety practice.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence



---

## SECTION 12: Ecological information

### 12.1 Toxicity

|                                                                       |                                                                                                                                                                          |
|-----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Toxicity to fish                                                      | semi-static test LC50 - Oncorhynchus mykiss (rainbow trout) - > 100 mg/l - 96 h<br>(OECD Test Guideline 203)<br>Remarks: (above the solubility limit in the test medium) |
| Toxicity to daphnia and other aquatic invertebrates                   | static test EC50 - Daphnia magna (Water flea) - > 100 mg/l - 48 h<br>(OECD Test Guideline 202)<br>Remarks: (above the solubility limit in the test medium)               |
| Toxicity to algae                                                     | static test ErC50 - Pseudokirchneriella subcapitata (algae) - > 100 mg/l - 72 h<br>(OECD Test Guideline 201)<br>Remarks: (above the solubility limit in the test medium) |
| Toxicity to bacteria                                                  | static test EC50 - activated sludge - > 3,200 mg/l - 3 h<br>(OECD Test Guideline 209)                                                                                    |
| Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity) | semi-static test NOEC - Daphnia magna (Water flea) - >= 100 mg/l - 21 d<br>(OECD Test Guideline 211)<br>Remarks: (above the solubility limit in the test medium)         |

### 12.2 Persistence and degradability

The methods for determining the biological degradability are not applicable to inorganic substances.

### 12.3 Bioaccumulative potential

|                                    |                                                    |
|------------------------------------|----------------------------------------------------|
| Bioaccumulation                    | Lepomis macrochirus - 60 d<br>- 640 µg/l(Selenium) |
| Bioconcentration factor (BCF): 7.7 |                                                    |

### 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 Endocrine disrupting properties

No data available

### 12.7 Other adverse effects

Discharge into the environment must be avoided.

---

## SECTION 13: Disposal considerations

### 13.1 Waste treatment methods

#### Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See [www.retrologistik.com](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: 3288    Class: 6.1    Packing group: III  
Proper shipping name: Toxic solid, inorganic, n.o.s. (Selenium)  
Reportable Quantity (RQ): 100 lbs  
Reportable Quantity (RQ): 10 lbs  
Poison Inhalation Hazard: No

#### IMDG

UN number: 3288    Class: 6.1    Packing group: III    EMS-No: F-A, S-A  
Proper shipping name: TOXIC SOLID, INORGANIC, N.O.S. (Selenium)

#### IATA

UN number: 3288    Class: 6.1    Packing group: III  
Proper shipping name: Toxic solid, inorganic, n.o.s. (Selenium)

---

## 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 |
|----------|-----------|---------------|
| Selenium | 7782-49-2 | 2007-07-01    |

#### SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

:  
**Reportable Quantity**    D010 lbs

#### Massachusetts Right To Know Components

|          | CAS-No.   | Revision Date |
|----------|-----------|---------------|
| Selenium | 7782-49-2 | 2007-07-01    |

#### Pennsylvania Right To Know Components

|          | CAS-No.   | Revision Date |
|----------|-----------|---------------|
| Selenium | 7782-49-2 | 2007-07-01    |

---

## 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: 6.8

Revision Date: 01/26/2023

Print Date: 10/07/2023

## SAFETY DATA SHEET

Version 6.6  
Revision Date 08/27/2022  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Silver

Product Number : 576832

Brand : Aldrich

CAS-No. : 7440-22-4

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

Company : Sigma-Aldrich 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)**

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 : Warning

Hazard statement(s)  
H410 : Very toxic to aquatic life with long lasting effects.

|                            |                                                                     |
|----------------------------|---------------------------------------------------------------------|
| Precautionary statement(s) |                                                                     |
| P273                       | Avoid release to the environment.                                   |
| P391                       | Collect spillage.                                                   |
| P501                       | Dispose of contents/ container to an approved waste disposal plant. |

## 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

### SECTION 3: Composition/information on ingredients

#### 3.1 Substances

|                  |                |
|------------------|----------------|
| Formula          | : Ag           |
| Molecular weight | : 107.87 g/mol |
| CAS-No.          | : 7440-22-4    |
| EC-No.           | : 231-131-3    |

| Component               | Classification                                                                                         | Concentration |
|-------------------------|--------------------------------------------------------------------------------------------------------|---------------|
| <b>colloidal silver</b> |                                                                                                        |               |
|                         | Aquatic Acute 1; Aquatic Chronic 1; H400, H410<br>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

##### 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.

##### In case of eye contact

After eye contact: rinse out with plenty of water. Remove contact lenses.

##### If swallowed

After swallowing: make victim drink water (two glasses at most). Consult doctor if feeling unwell.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

## **SECTION 5: Firefighting measures**

### **5.1 Extinguishing media**

#### **Suitable extinguishing media**

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

#### **Unsuitable extinguishing media**

For this substance/mixture no limitations of extinguishing agents are given.

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

Silver/silver oxides

Not combustible.

Ambient fire may liberate hazardous vapours.

### **5.3 Advice for firefighters**

In the event of fire, wear self-contained breathing apparatus.

### **5.4 Further information**

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. 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 dry. 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.

Air sensitive. Handle and store under inert gas.

#### **Storage class**

Storage class (TRGS 510): 13: Non Combustible Solids

### **7.3 Specific end use(s)**

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

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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                                                                                   |
|------------------|-----------|-------|------------------------|-----------------------------------------------------------------------------------------|
| colloidal silver | 7440-22-4 | TWA   | 0.1 mg/m <sup>3</sup>  | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|                  |           | PEL   | 0.01 mg/m <sup>3</sup> | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|                  |           | TWA   | 0.01 mg/m <sup>3</sup> | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |

### 8.2 Exposure controls

#### Appropriate engineering controls

Change contaminated clothing. Wash hands after working with substance.

#### Personal protective equipment

##### Eye/face protection

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

##### 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: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: KCL 741 Dermatril® L

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: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: KCL 741 Dermatril® L

##### 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: powder                                 |
| b) Odor                                         | No data available                            |
| c) Odor Threshold                               | No data available                            |
| d) pH                                           | No data available                            |
| e) Melting point/freezing point                 | Melting point/range: 960 °C (1760 °F) - lit. |
| f) Initial boiling point and boiling range      | 2,212 °C 4,014 °F - lit.                     |
| g) Flash point                                  | ( )Not applicable                            |
| h) Evaporation rate                             | No data available                            |
| i) Flammability (solid, gas)                    | The product is not flammable.                |
| j) Upper/lower flammability or explosive limits | No data available                            |
| k) Vapor pressure                               | No data available                            |
| l) Vapor density                                | No data available                            |
| m) Density                                      | 10.49 g/mL - lit.                            |
| Relative density                                | No data available                            |
| n) Water solubility                             | insoluble                                    |
| o) Partition coefficient: n-octanol/water       | Not applicable for inorganic substances      |
| 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                                         |

### 9.2 Other safety information

No data available



---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

### 10.3 Possibility of hazardous reactions

Risk of explosion with:

Ammonia

ammonium compounds

ethanol

Nitric acid

oxalic acid

performic acid

acetylidene

Risk of ignition or formation of inflammable gases or vapours with:

halogen-halogen compounds

Nitric acid

conc. sulfuric acid

Exothermic reaction with:

azides

Ethylene oxide

peroxi compounds

Organic Substances

### 10.4 Conditions to avoid

no information available

### 10.5 Incompatible materials

No data available

### 10.6 Hazardous decomposition products

In the event of fire: see section 5

---

## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

#### Acute toxicity

Oral: No data available

Inhalation: No data available

Dermal: 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

(OECD Test Guideline 405)

**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

**11.2 Additional Information**

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

Hazardous properties cannot be excluded but are unlikely when the product is handled appropriately.

Further data:

Handle in accordance with good industrial hygiene and safety practice.

---

**SECTION 12: Ecological information**

**12.1 Toxicity**

|                  |                                                                                   |
|------------------|-----------------------------------------------------------------------------------|
| Toxicity to fish | semi-static test LC50 - Pimephales promelas (fathead minnow) - 0.0021 mg/l - 96 h |
|                  | Remarks: (ECOTOX Database)                                                        |

**12.2 Persistence and degradability**

The methods for determining biodegradability are not applicable to inorganic substances.

**12.3 Bioaccumulative potential**

No data available

**12.4 Mobility in soil**

No data available

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## 12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

## 12.6 Endocrine disrupting properties

No data available

## 12.7 Other adverse effects

Discharge into the environment must be avoided.

---

## SECTION 13: Disposal considerations

### 13.1 Waste treatment methods

#### Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See [www.retrologistik.com](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: 3077    Class: 9    Packing group: III  
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (colloidal silver)  
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.  
Marine pollutant : yes  
Marine pollutant : no

### IATA

UN number: 3077    Class: 9    Packing group: III  
Proper shipping name: Environmentally hazardous substance, solid, n.o.s.

### 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

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

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**SARA 311/312 Hazards**

No SARA Hazards

**Massachusetts Right To Know Components**

No components are subject to the Massachusetts Right to Know Act.

---

**SECTION 16: Other information****Further information**

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](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: 6.6

Revision Date: 08/27/2022

Print Date: 10/07/2023

## SAFETY DATA SHEET

Version 6.3  
Revision Date 05/25/2023  
Print Date 08/12/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Aluminum sulfate

Product Number : 202614  
Brand : Aldrich  
CAS-No. : 10043-01-3

**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)**

Corrosive to Metals (Category 1), H290  
Serious eye damage (Category 1), H318

For the full text of the H-Statements mentioned in this Section, see Section 16.

**2.2 GHS Label elements, including precautionary statements**

Pictogram



Signal Word

Danger

|                            |                                                                                                                                                                            |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hazard statement(s)        |                                                                                                                                                                            |
| H290                       | May be corrosive to metals.                                                                                                                                                |
| H318                       | Causes serious eye damage.                                                                                                                                                 |
| Precautionary statement(s) |                                                                                                                                                                            |
| P234                       | Keep only in original container.                                                                                                                                           |
| P280                       | Wear eye protection/ face protection.                                                                                                                                      |
| 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. |
| P390                       | Absorb spillage to prevent material damage.                                                                                                                                |
| P406                       | Store in corrosive resistant container with a resistant inner liner.                                                                                                       |

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

|                  |                                        |
|------------------|----------------------------------------|
| Formula          | : $\text{Al}_2\text{O}_{12}\text{S}_3$ |
| Molecular weight | : 342.15 g/mol                         |
| CAS-No.          | : 10043-01-3                           |
| EC-No.           | : 233-135-0                            |

| Component                | Classification                          | Concentration |
|--------------------------|-----------------------------------------|---------------|
| <b>aluminium sulfate</b> |                                         |               |
|                          | Met. Corr. 1; Eye Dam. 1;<br>H290, H318 | <= 100 %      |

For the full text of the H-Statements mentioned in this Section, see Section 16.

## SECTION 4: First aid measures

### 4.1 Description of first-aid measures

#### General advice

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.

#### In case of eye contact

After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist. Remove contact lenses.

#### If swallowed

After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

### **SECTION 5: Firefighting measures**

#### **5.1 Extinguishing media**

##### **Suitable extinguishing media**

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

##### **Unsuitable extinguishing media**

For this substance/mixture no limitations of extinguishing agents are given.

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

Sulfur oxides

Aluminum oxide

Not combustible.

Ambient fire may liberate hazardous vapours.

#### **5.3 Advice for firefighters**

In the event of fire, wear self-contained breathing apparatus.

#### **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 dry. 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

No metal containers.

Tightly closed. Dry.

hygroscopic Store under inert gas.

#### Storage class

Storage class (TRGS 510): 8B: Non-combustible, corrosive hazardous materials

### 7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

---

## SECTION 8: Exposure controls/personal protection

### 8.1 Control parameters

#### Ingredients with workplace control parameters

| Component         | CAS-No.    | Value | Control parameters  | Basis                                                                                   |
|-------------------|------------|-------|---------------------|-----------------------------------------------------------------------------------------|
| aluminium sulfate | 10043-01-3 | TWA   | 2 mg/m <sup>3</sup> | USA. NIOSH Recommended Exposure Limits                                                  |
|                   |            | PEL   | 2 mg/m <sup>3</sup> | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |

### 8.2 Exposure controls

#### Appropriate engineering controls

Change contaminated clothing. Wash hands after working with substance.

#### Personal protective equipment

##### Eye/face protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Tightly fitting safety goggles

##### 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: powder<br>Color: white                          |
| b) Odor                                         | odorless                                              |
| c) Odor Threshold                               | Not applicable                                        |
| d) pH                                           | No data available                                     |
| e) Melting point/freezing point                 | Melting point/range: 770 °C (1418 °F) - dec.          |
| f) Initial boiling point and boiling range      | 112 - 116 °C 234 - 241 °F                             |
| g) Flash point                                  | ( )No data available                                  |
| h) Evaporation rate                             | No data available                                     |
| i) Flammability (solid, gas)                    | The product is not flammable. - Flammability (solids) |
| j) Upper/lower flammability or explosive limits | No data available                                     |
| k) Vapor pressure                               | No data available                                     |
| l) Vapor density                                | No data available                                     |
| m) Density                                      | 2.71 g/mL at 25 °C (77 °F) - lit.                     |
| Relative density                                | No data available                                     |
| n) Water solubility                             | ca.0.00001 g/l at 21.5 °C (70.7 °F) - insoluble       |
| o) Partition coefficient: n-octanol/water       | Not applicable for inorganic substances               |
| 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                                                  |

#### 9.2 Other safety information

No data available

---

## **SECTION 10: Stability and reactivity**

### **10.1 Reactivity**

No data available

### **10.2 Chemical stability**

The product is chemically stable under standard ambient conditions (room temperature) .

### **10.3 Possibility of hazardous reactions**

No data available

### **10.4 Conditions to avoid**

Air Exposure to moisture.

no information available

### **10.5 Incompatible materials**

No data available

### **10.6 Hazardous decomposition products**

In the event of fire: see section 5

---

## **SECTION 11: Toxicological information**

### **11.1 Information on toxicological effects**

#### **Acute toxicity**

LD50 Oral - Rat - male and female - > 2,000 mg/kg

(OECD Test Guideline 401)

Inhalation: No data available

LD50 Dermal - Rabbit - male and female - > 5,000 mg/kg

(OECD Test Guideline 402)

No data available

#### **Skin corrosion/irritation**

Skin - Rabbit

Result: No skin irritation - 4 h

(OECD Test Guideline 404)

#### **Serious eye damage/eye irritation**

Eyes - Rabbit

Result: Irreversible effects on the eye

(OECD Test Guideline 405)

#### **Respiratory or skin sensitization**

Local lymph node assay (LLNA) - Mouse

Result: negative

(OECD Test Guideline 429)

#### **Germ cell mutagenicity**

Test Type: Ames test

Test system: Escherichia coli/Salmonella typhimurium

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 471

Result: negative

Test Type: In vitro mammalian cell gene mutation test

Test system: mouse lymphoma cells

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 476

Result: negative

Test Type: Micronucleus test

Test system: Human lymphocytes

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 487

Result: negative

Test Type: Micronucleus test

Species: Rat

Application Route: Oral

Method: OECD Test Guideline 474

Result: negative

Remarks: (in analogy to similar products)

The value is given in analogy to the following substances: aluminium hydroxide

Species: Rat

Application Route: Oral

Remarks: Cytogenetic analysis

### **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

## **11.2 Additional Information**

Repeated dose toxicity - Rat - male - Oral - NOAEL (No observed adverse effect level) - 18 mg/kg - LOAEL (Lowest observed adverse effect level) - 90 mg/kg

Remarks: (in analogy to similar products)

The value is given in analogy to the following substances: aluminium(III) chloride, anhydrous

RTECS: BD1700000

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

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

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

---

## SECTION 12: Ecological information

### 12.1 Toxicity

|                                                                       |                                                                                                                  |
|-----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| Toxicity to fish                                                      | semi-static test LC50 - Danio rerio (zebra fish) - > 87.5 mg/l - 96 h<br>(OECD Test Guideline 203)               |
| Toxicity to daphnia and other aquatic invertebrates                   | static test EC50 - Daphnia magna (Water flea) - > 200 mg/l - 48 h<br>(OECD Test Guideline 202)                   |
| Toxicity to algae                                                     | static test ErC50 - Pseudokirchneriella subcapitata (microalgae) - 0.24 mg/l - 72 h<br>(OECD Test Guideline 201) |
| Toxicity to bacteria                                                  | static test EC50 - activated sludge - > 200 mg/l - 3 h<br>(OECD Test Guideline 209)                              |
| Toxicity to fish(Chronic toxicity)                                    | semi-static test NOEC - Salvelinus fontinalis (Brook trout) - 0.024 mg/l - 60 d<br>Remarks: (ECHA)               |
|                                                                       | semi-static test NOEC - Salvelinus fontinalis (Brook trout) - 0.024 mg/l - 60 d<br>Remarks: (ECHA)               |
|                                                                       | semi-static test NOEC - Salvelinus fontinalis (Brook trout) - 0.024 mg/l - 60 d<br>Remarks: (ECHA)               |
| Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity) | semi-static test NOEC - Ceriodaphnia dubia (water flea) - 3.8 mg/l - 8 d<br>(US-EPA)                             |

### 12.2 Persistence and degradability

The methods for determining biodegradability are not applicable to inorganic substances.

### 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 Endocrine disrupting properties

No data available

## 12.7 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.

---

## SECTION 14: Transport information

### DOT (US)

UN number: 3260    Class: 8    Packing group: III  
Proper shipping name: Corrosive solid, acidic, inorganic, n.o.s. (aluminium sulfate)  
Reportable Quantity (RQ): 5000 lbs  
Poison Inhalation Hazard: No

### IMDG

UN number: 3260    Class: 8    Packing group: III    EMS-No: F-A, S-B  
Proper shipping name: CORROSIVE SOLID, ACIDIC, INORGANIC, N.O.S. (aluminium sulfate)

### IATA

UN number: 3260    Class: 8    Packing group: III  
Proper shipping name: Corrosive solid, acidic, inorganic, n.o.s. (aluminium sulfate)

---

## SECTION 15: Regulatory information

### SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

### SARA 313 Components

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

### SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

### Massachusetts Right To Know Components

Aldrich - 202614

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|                   |                       |                             |
|-------------------|-----------------------|-----------------------------|
| aluminium sulfate | CAS-No.<br>10043-01-3 | Revision Date<br>1993-02-16 |
|-------------------|-----------------------|-----------------------------|

#### **Pennsylvania Right To Know Components**

|                   |                       |                             |
|-------------------|-----------------------|-----------------------------|
| aluminium sulfate | CAS-No.<br>10043-01-3 | Revision Date<br>1993-02-16 |
|-------------------|-----------------------|-----------------------------|

---

### **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: 6.3

Revision Date: 05/25/2023

Print Date: 08/12/2023

## SAFETY DATA SHEET

Version 8.8  
Revision Date 05/25/2023  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Tetrachloroethylene

Product Number : 443786  
Brand : SIGALD  
Index-No. : 602-028-00-4  
CAS-No. : 127-18-4

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

Company : Sigma-Aldrich Inc.  
3050 SPRUCE ST  
ST. LOUIS MO 63103  
UNITED STATES

Telephone : +1 314 771-5765  
Fax : +1 800 325-5052

**1.4 Emergency telephone**

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-  
527-3887 CHEMTREC (International) 24  
Hours/day; 7 Days/week

**SECTION 2: Hazards identification****2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Skin irritation (Category 2), H315  
Eye irritation (Category 2A), H319  
Skin sensitization (Category 1), H317  
Carcinogenicity (Category 2), H351  
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336  
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**

SIGALD - 443786

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Pictogram



Signal Word

Warning

Hazard statement(s)

|      |                                                  |
|------|--------------------------------------------------|
| H315 | Causes skin irritation.                          |
| H317 | May cause an allergic skin reaction.             |
| H319 | Causes serious eye irritation.                   |
| H336 | May cause drowsiness or dizziness.               |
| H351 | Suspected of causing cancer.                     |
| H411 | Toxic to aquatic life with long lasting effects. |

Precautionary statement(s)

|                    |                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------|
| P201               | Obtain special instructions before use.                                                                                          |
| P202               | Do not handle until all safety precautions have been read and understood.                                                        |
| P261               | Avoid breathing mist or vapors.                                                                                                  |
| P264               | Wash skin thoroughly after handling.                                                                                             |
| P271               | Use only outdoors or in a well-ventilated area.                                                                                  |
| P272               | Contaminated work clothing must not be allowed out of the workplace.                                                             |
| P273               | Avoid release to the environment.                                                                                                |
| P280               | Wear protective gloves/ protective clothing/ eye protection/ face protection.                                                    |
| P302 + P352        | IF ON SKIN: Wash with plenty of soap and water.                                                                                  |
| P304 + P340 + P312 | IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.      |
| P305 + P351 + P338 | IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. |
| P308 + P313        | IF exposed or concerned: Get medical advice/ attention.                                                                          |
| P333 + P313        | If skin irritation or rash occurs: Get medical advice/ attention.                                                                |
| P337 + P313        | If eye irritation persists: Get medical advice/ attention.                                                                       |
| P362               | Take off contaminated clothing and wash before reuse.                                                                            |
| P391               | Collect spillage.                                                                                                                |
| P403 + P233        | Store in a well-ventilated place. Keep container tightly closed.                                                                 |
| P405               | Store locked up.                                                                                                                 |
| P501               | Dispose of contents/ container to an approved waste disposal plant.                                                              |

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

---

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

|                  |   |                                |
|------------------|---|--------------------------------|
| Synonyms         | : | Perchloroethylene<br>PCE       |
| Formula          | : | C <sub>2</sub> Cl <sub>4</sub> |
| Molecular weight | : | 165.83 g/mol                   |
| CAS-No.          | : | 127-18-4                       |

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EC-No. : 204-825-9  
Index-No. : 602-028-00-4

| Component                 | Classification                                                                                                                                                                                                       | Concentration |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>Tetrachlorethylene</b> |                                                                                                                                                                                                                      |               |
|                           | Skin Irrit. 2; Eye Irrit. 2A;<br>Skin Sens. 1; Carc. 2;<br>STOT SE 3; Aquatic Acute<br>2; Aquatic Chronic 2;<br>H315, H319, H317, H351,<br>H336, H401, H411<br>Concentration limits:<br>>= 20 %: STOT SE 3,<br>H336; | <= 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

After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

#### Suitable extinguishing media

Water Foam Carbon dioxide (CO2) Dry powder

**Unsuitable extinguishing media**

For this substance/mixture no limitations of extinguishing agents are given.

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

Carbon oxides

Hydrogen 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: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.

For personal protection see section 8.

**6.2 Environmental precautions**

Do not let product enter drains.

**6.3 Methods and materials for containment and cleaning up**

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent material (e.g. Chemizorb® ). Dispose of properly. Clean up affected area.

**6.4 Reference to other sections**

For disposal see section 13.

---

**SECTION 7: Handling and storage****7.1 Precautions for safe handling****Advice on safe handling**

Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

**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**

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                                                                                   |
|-------------------|----------|--------------------------------------------------------------|----------------------------------|-----------------------------------------------------------------------------------------|
| Tetrachlorethylen | 127-18-4 | TWA                                                          | 25 ppm                           | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|                   | Remarks  | Confirmed animal carcinogen with unknown relevance to humans |                                  |                                                                                         |
|                   |          | STEL                                                         | 100 ppm                          | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|                   |          | Confirmed animal carcinogen with unknown relevance to humans |                                  |                                                                                         |
|                   |          | Potential Occupational Carcinogen                            |                                  |                                                                                         |
|                   |          | TWA                                                          | 100 ppm                          | USA. Occupational Exposure Limits (OSHA) - Table Z-2                                    |
|                   |          | CEIL                                                         | 200 ppm                          | USA. Occupational Exposure Limits (OSHA) - Table Z-2                                    |
|                   |          | Peak                                                         | 300 ppm                          | USA. Occupational Exposure Limits (OSHA) - Table Z-2                                    |
|                   |          | PEL                                                          | 25 ppm<br>170 mg/m <sup>3</sup>  | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|                   |          | STEL                                                         | 100 ppm<br>685 mg/m <sup>3</sup> | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|                   |          | C                                                            | 300 ppm                          | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |

#### Biological occupational exposure limits

| Component         | CAS-No.  | Parameters                                      | Value              | Biological specimen | Basis                                     |
|-------------------|----------|-------------------------------------------------|--------------------|---------------------|-------------------------------------------|
| Tetrachlorethylen | 127-18-4 | Tetrachloro ethylene                            | 3parts per million | In end-exhaled air  | ACGIH - Biological Exposure Indices (BEI) |
|                   | Remarks  | Prior to shift (16 hours after exposure ceases) |                    |                     |                                           |

|  |  |                                                 |          |          |                                           |
|--|--|-------------------------------------------------|----------|----------|-------------------------------------------|
|  |  | Tetrachloro ethylene                            | 0.5 mg/l | In blood | ACGIH - Biological Exposure Indices (BEI) |
|  |  | Prior to shift (16 hours after exposure ceases) |          |          |                                           |

## 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

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: Viton®

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

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: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 240 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, 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, clear<br>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: -22 °C (-8 °F) - lit.                        |
| f) Initial boiling point and boiling range      | 121 °C 250 °F - lit.                                              |
| g) Flash point                                  | ( )No data available                                              |
| h) Evaporation rate                             | No data available                                                 |
| i) Flammability (solid, gas)                    | No data available                                                 |
| j) Upper/lower flammability or explosive limits | No data available                                                 |
| k) Vapor pressure                               | 25.3 hPa at 25.0 °C (77.0 °F)<br>17.3 hPa at 20.0 °C(68.0 °F)     |
| l) Vapor density                                | No data available                                                 |
| m) Density                                      | 1.623 g/cm <sup>3</sup> at 25 °C (77 °F) - lit.                   |
| Relative density                                | No data available                                                 |
| n) Water solubility                             | 0.15 g/l at 25 °C (77 °F)                                         |
| o) Partition coefficient: n-octanol/water       | log Pow: 2.53 at 23 °C (73 °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                         | No data available                                                 |

### 9.2 Other safety information

|                 |                            |
|-----------------|----------------------------|
| Surface tension | 32.1 mN/m at 20 °C (68 °F) |
|-----------------|----------------------------|

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

### 10.3 Possibility of hazardous reactions

Risk of explosion with:

Alkali metals

Aluminum

sodium amide

Barium

nitrogen dioxide

Oxygen

with

alkali hydroxides

Exothermic reaction with:

strong alkalis

Alkaline earth metals

strong alkalis

Light metals

Powdered metals

Oxidizing agents

Strong acids

Strong bases

nitrous gases

Risk of ignition or formation of inflammable gases or vapours with:

zinc oxide

with

Aluminum

### 10.4 Conditions to avoid

no information available

### 10.5 Incompatible materials

various plastics

### 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 and female - 3,420 mg/kg

(OECD Test Guideline 401)

Remarks: (ECHA)

Inhalation: No data available

Dermal: No data available

No data available

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**Skin corrosion/irritation**

Skin - Rabbit

Result: Skin irritation - 4 h  
(OECD Test Guideline 404)

Remarks: (ECHA)

**Serious eye damage/eye irritation**

Eyes - Rabbit

Result: Mild eye irritation - 24 h  
(Draize Test)

Remarks: (RTECS)

**Respiratory or skin sensitization**

Local lymph node assay (LLNA) - Mouse

Result: May cause sensitization by skin contact.  
(OECD Test Guideline 429)

Remarks: (ECHA)

**Germ cell mutagenicity**

Test Type: Chromosome aberration test in vitro

Test system: Chinese hamster ovary cells

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 473

Result: negative

Remarks: (ECHA)

Test Type: Ames test

Test system: Salmonella typhimurium

Metabolic activation: without metabolic activation

Method: OECD Test Guideline 471

Result: negative

Remarks: (ECHA)

Test Type: Micronucleus test

Species: Mouse

Application Route: Intraperitoneal

Method: OECD Test Guideline 474

Result: negative

Remarks: (ECHA)

**Carcinogenicity**

Suspected of causing cancer.

IARC: 2A - Group 2A: Probably carcinogenic to humans (Tetrachlorethylene)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (Tetrachlorethylene)

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**

May cause drowsiness or dizziness.

**Specific target organ toxicity - repeated exposure**

No data available

**Aspiration hazard**

No data available

**11.2 Additional Information**

Repeated dose toxicity - Mouse - female - Oral - LOAEL (Lowest observed adverse effect level) - 390 mg/kg

RTECS: KX3850000

narcosis, Liver injury may occur., Kidney injury may occur.

---

**SECTION 12: Ecological information****12.1 Toxicity**

|                  |                                                                                                        |
|------------------|--------------------------------------------------------------------------------------------------------|
| Toxicity to fish | flow-through test LC50 - <i>Oncorhynchus mykiss</i> (rainbow trout) - 5 mg/l - 96 h<br>Remarks: (ECHA) |
|------------------|--------------------------------------------------------------------------------------------------------|

|                                                     |                                                             |
|-----------------------------------------------------|-------------------------------------------------------------|
| Toxicity to daphnia and other aquatic invertebrates | EC50 - <i>Daphnia magna</i> (Water flea) - 7.50 mg/l - 48 h |
|-----------------------------------------------------|-------------------------------------------------------------|

|                   |                                                                                              |
|-------------------|----------------------------------------------------------------------------------------------|
| Toxicity to algae | ErC50 - <i>Chlamydomonas reinhardtii</i> (green algae) - 3.64 mg/l - 72 h<br>Remarks: (ECHA) |
|-------------------|----------------------------------------------------------------------------------------------|

|                                    |                                                                                           |
|------------------------------------|-------------------------------------------------------------------------------------------|
| Toxicity to fish(Chronic toxicity) | flow-through test NOEC - <i>Jordanella floridae</i> - 1.99 mg/l - 10 d<br>Remarks: (ECHA) |
|------------------------------------|-------------------------------------------------------------------------------------------|

|                                                                       |                                                                                                 |
|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity) | semi-static test NOEC - <i>Daphnia magna</i> (Water flea) - 0.51 mg/l - 28 d<br>Remarks: (ECHA) |
|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|

**12.2 Persistence and degradability**

|                  |                                                                                                         |
|------------------|---------------------------------------------------------------------------------------------------------|
| Biodegradability | aerobic - Exposure time 28 d<br>Result: 11 % - Not readily biodegradable.<br>(OECD Test Guideline 301C) |
|------------------|---------------------------------------------------------------------------------------------------------|

**12.3 Bioaccumulative potential**

|                 |                                                                                    |
|-----------------|------------------------------------------------------------------------------------|
| Bioaccumulation | <i>Lepomis macrochirus</i> (Bluegill) - 21 d<br>- 0.00343 mg/l(Tetrachlorethylene) |
|-----------------|------------------------------------------------------------------------------------|

Bioconcentration factor (BCF): 49

**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 Endocrine disrupting properties**

No data available

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## 12.7 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.

---

## SECTION 14: Transport information

#### DOT (US)

UN number: 1897    Class: 6.1    Packing group: III  
Proper shipping name: Tetrachloroethylene  
Reportable Quantity (RQ): 100 lbs  
Reportable Quantity (RQ): 100 lbs  
Reportable Quantity (RQ): 10 lbs  
Reportable Quantity (RQ): 10 lbs  
Marine pollutant: yes    Poison Inhalation Hazard: No

#### IMDG

UN number: 1897    Class: 6.1    Packing group: III    EMS-No: F-A, S-A  
Proper shipping name: TETRACHLOROETHYLENE  
Marine pollutant : yes  
Marine pollutant : yes

#### IATA

UN number: 1897    Class: 6.1    Packing group: III  
Proper shipping name: Tetrachloroethylene

---

## 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 |
| Tetrachlorethylene | 127-18-4 | 2020-07-14    |

#### SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

:

**Reportable Quantity**      D039 lbs  
F001 lbs  
F002 lbs

**Massachusetts Right To Know Components**

|                    |                     |                             |
|--------------------|---------------------|-----------------------------|
| Tetrachlorethylene | CAS-No.<br>127-18-4 | Revision Date<br>2020-07-14 |
|--------------------|---------------------|-----------------------------|

**Pennsylvania Right To Know Components**

|                    |                     |                             |
|--------------------|---------------------|-----------------------------|
| Tetrachlorethylene | CAS-No.<br>127-18-4 | Revision Date<br>2020-07-14 |
|--------------------|---------------------|-----------------------------|

**California Prop. 65 Components**

|                                                                                                                                                                                     |                     |                             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------------------------|
| , 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> . Tetrachlorethylene | CAS-No.<br>127-18-4 | Revision Date<br>2017-04-11 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------------------------|

---

**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: 8.8

Revision Date: 05/25/2023

Print Date: 10/07/2023

## SAFETY DATA SHEET

Version 6.7  
Revision Date 05/25/2023  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Thallium

Product Number : 277932

Brand : Aldrich

Index-No. : 081-001-00-3

CAS-No. : 7440-28-0

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

Company : Sigma-Aldrich 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, Inhalation (Category 2), H330

Specific target organ toxicity - repeated exposure (Category 2), H373

Short-term (acute) aquatic hazard (Category 3), H402

Long-term (chronic) aquatic hazard (Category 4), H413

For the full text of the H-Statements mentioned in this Section, see Section 16.

**2.2 GHS Label elements, including precautionary statements**

Pictogram



Signal Word

Danger

Hazard statement(s)

H300 + H330

H373

Fatal if swallowed or if inhaled.

May cause damage to organs through prolonged or repeated exposure.

H402

Harmful to aquatic life.

H413

May cause long lasting harmful effects to aquatic life.

Precautionary statement(s)

P260

Do not breathe dust.

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.

P284

Wear respiratory protection.

P301 + P310 + P330

IF SWALLOWED: Immediately call a POISON CENTER/ doctor. Rinse mouth.

P304 + P340 + P310

IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor.

P314

Get medical advice/ attention if you feel unwell.

P403 + P233

Store in a well-ventilated place. Keep container tightly closed.

P405

Store locked up.

P501

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

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Formula : TI  
Molecular weight : 204.38 g/mol  
CAS-No. : 7440-28-0  
EC-No. : 231-138-1  
Index-No. : 081-001-00-3

| Component       | Classification                                                                                     | Concentration |
|-----------------|----------------------------------------------------------------------------------------------------|---------------|
| <b>Thallium</b> |                                                                                                    |               |
|                 | Acute Tox. 2; STOT RE 2;<br>Aquatic Acute 3; Aquatic<br>Chronic 4; H300, H330,<br>H373, H402, H413 | <= 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. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

#### In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

#### In case of eye contact

After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

#### If swallowed

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

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

#### Unsuitable extinguishing media

For this substance/mixture no limitations of extinguishing agents are given.

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

thallium oxides

Not combustible.

Ambient fire may liberate hazardous vapours.

### 5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

### 5.4 Further information

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**

Change contaminated clothing. Preventive skin protection recommended. Wash hands 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): 6.1B: 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                                                                                   |
|-----------|-----------|---------------------------------|--------------------|-----------------------------------------------------------------------------------------|
| Thallium  | 7440-28-0 | TWA                             | 0.1 mg/m3          | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|           | Remarks   | Skin designation                |                    |                                                                                         |
|           |           | TWA                             | 0.02 mg/m3         | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|           |           | Danger of cutaneous absorption  |                    |                                                                                         |
|           |           | TWA                             | 0.1 mg/m3          | USA. NIOSH Recommended Exposure Limits                                                  |
|           |           | Potential for dermal absorption |                    |                                                                                         |
|           |           | PEL                             | 0.1 mg/m3          | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|           |           | Skin                            |                    |                                                                                         |

## 8.2 Exposure controls

### Appropriate engineering controls

Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.

### Personal protective equipment

#### Eye/face protection

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

#### 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: granular<br>Color: light gray         |
| b) Odor           | No data available                           |
| c) Odor Threshold | No data available                           |
| d) pH             | No data available                           |
| e) Melting        | Melting point/range: 303 °C (577 °F) - lit. |

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|    |                                              |                               |
|----|----------------------------------------------|-------------------------------|
|    | point/freezing point                         |                               |
| f) | Initial boiling point and boiling range      | 1,457 °C 2,655 °F - lit.      |
| g) | Flash point                                  | ( )Not applicable             |
| h) | Evaporation rate                             | No data available             |
| i) | Flammability (solid, gas)                    | The product is not flammable. |
| j) | Upper/lower flammability or explosive limits | No data available             |
| k) | 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

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

Air sensitive.  
no information available

### 10.5 Incompatible materials

Strong acids, Strong oxidizing agents

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## 10.6 Hazardous decomposition products

In the event of fire: see section 5

---

## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

#### Acute toxicity

Acute toxicity estimate Oral - 5.1 mg/kg

(Expert judgment)

Oral: No data available

Acute toxicity estimate Inhalation - 4 h - 0.051 mg/l - dust/mist

(Expert judgment)

Dermal: No data available

No data available

#### Skin corrosion/irritation

Remarks: No data available

#### Serious eye damage/eye irritation

Remarks: 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

Possible risk of congenital malformation in the fetus.

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.

#### Aspiration hazard

No data available

### 11.2 Additional Information

RTECS: XG3425000

The most characteristic symptom of thallium exposure is alopecia (loss of hair). Cutaneous effects may include dry, scaly skin and impairment of nail growth often resulting in the appearance of crescent-shaped strips across fingernails and toenails (Mees' line). Other

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symptoms in acute poisoning relate chiefly to the gastrointestinal tract, nervous system, skin, eyes, and cardiovascular system. Acute poisoning results in swelling of the feet and legs, arthralgia, vomiting, insomnia, hyperesthesia and paresthesia of the hands and feet, mental confusion, polyneuritis with severe pain in the legs and loins, partial paralysis of the legs, angina-like pains, nephritis, wasting and weakness, and lymphocytosis and eosinophilia. In chronic poisoning, central and peripheral nervous system abnormalities may persist including ataxia, tremor, incoordination, paralysis of extremities, endocrine disorders, memory loss, and psychoses may develop., 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 - Cyprinodon variegatus (sheepshead minnow) - 21.0 mg/l - 96.0 h           |
|                  | mortality NOEC - Cyprinodon variegatus (sheepshead minnow) - 14.0 mg/l - 96.0 h |

### 12.2 Persistence and degradability

No data available

### 12.3 Bioaccumulative potential

No data available

### 12.4 Mobility in soil

No data available

### 12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

### 12.6 Endocrine disrupting properties

No data available

### 12.7 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.

---

## SECTION 14: Transport information

### DOT (US)

UN number: 3288    Class: 6.1    Packing group: II  
Proper shipping name: Toxic solid, inorganic, n.o.s. (Thallium)  
Reportable Quantity (RQ): 1000 lbs  
Poison Inhalation Hazard: No

### IMDG

UN number: 3288    Class: 6.1    Packing group: II    EMS-No: F-A, S-A  
Proper shipping name: TOXIC SOLID, INORGANIC, N.O.S. (Thallium)

### IATA

UN number: 3288    Class: 6.1    Packing group: II  
Proper shipping name: Toxic solid, inorganic, n.o.s. (Thallium)

---

## 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 |
|----------|-----------|---------------|
| Thallium | 7440-28-0 | 2007-07-01    |

### SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

### Massachusetts Right To Know Components

|          | CAS-No.   | Revision Date |
|----------|-----------|---------------|
| Thallium | 7440-28-0 | 2007-07-01    |

### Pennsylvania Right To Know Components

|          | CAS-No.   | Revision Date |
|----------|-----------|---------------|
| Thallium | 7440-28-0 | 2007-07-01    |

---

## 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

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Version: 6.7

Revision Date: 05/25/2023

Print Date: 10/07/2023

## SAFETY DATA SHEET

Version 6.21  
Revision Date 08/23/2023  
Print Date 08/23/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Toluene

Product Number : 244511  
Brand : Sigma-Aldrich  
Index-No. : 601-021-00-3  
CAS-No. : 108-88-3

**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)**

Flammable liquids (Category 2), H225  
Skin irritation (Category 2), H315  
Reproductive toxicity (Category 2), H361  
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336  
Specific target organ toxicity - repeated exposure (Category 2), Central nervous system, H373  
Aspiration hazard (Category 1), H304  
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)

|      |                                                                                             |
|------|---------------------------------------------------------------------------------------------|
| H225 | Highly flammable liquid and vapor.                                                          |
| H304 | May be fatal if swallowed and enters airways.                                               |
| H315 | Causes skin irritation.                                                                     |
| H336 | May cause drowsiness or dizziness.                                                          |
| H361 | Suspected of damaging fertility or the unborn child.                                        |
| H373 | May cause damage to organs (Central nervous system) through prolonged or repeated exposure. |
| H401 | Toxic to aquatic life.                                                                      |
| H412 | Harmful to aquatic life with long lasting effects.                                          |

Precautionary statement(s)

|                    |                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------|
| P201               | Obtain special instructions before use.                                                                                     |
| P202               | Do not handle until all safety precautions have been read and understood.                                                   |
| P210               | Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.                                                         |
| P233               | Keep container tightly closed.                                                                                              |
| P240               | Ground/bond container and receiving equipment.                                                                              |
| P241               | Use explosion-proof electrical/ ventilating/ lighting/ equipment.                                                           |
| P242               | Use only non-sparking tools.                                                                                                |
| P243               | Take precautionary measures against static discharge.                                                                       |
| P260               | Do not breathe mist or vapors.                                                                                              |
| P264               | Wash skin thoroughly after handling.                                                                                        |
| P271               | Use only outdoors or in a well-ventilated area.                                                                             |
| P273               | Avoid release to the environment.                                                                                           |
| P280               | Wear protective gloves/ protective clothing/ eye protection/ face protection.                                               |
| P301 + P310        | IF SWALLOWED: Immediately call a POISON CENTER/ doctor.                                                                     |
| P303 + P361 + P353 | IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.                        |
| 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.                                                                     |
| P331               | Do NOT induce vomiting.                                                                                                     |
| P332 + P313        | If skin irritation occurs: Get medical advice/ attention.                                                                   |
| P362               | Take off contaminated clothing and wash before reuse.                                                                       |
| P370 + P378        | In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.                                        |
| P403 + P233        | Store in a well-ventilated place. Keep container tightly closed.                                                            |
| P403 + P235        | Store in a well-ventilated place. Keep cool.                                                                                |
| P405               | Store locked up.                                                                                                            |
| P501               | Dispose of contents/ container to an approved waste disposal plant.                                                         |

## 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

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## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Formula : C<sub>7</sub>H<sub>8</sub>  
Molecular weight : 92.14 g/mol  
CAS-No. : 108-88-3  
EC-No. : 203-625-9  
Index-No. : 601-021-00-3

| Component      | Classification                                                                                                                                                                                                                   | Concentration |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>Toluene</b> |                                                                                                                                                                                                                                  |               |
|                | Flam. Liq. 2; Skin Irrit. 2;<br>Repr. 2; STOT SE 3; STOT<br>RE 2; Asp. Tox. 1; Aquatic<br>Acute 2; Aquatic Chronic<br>3; H225, H315, H361,<br>H336, H373, H304, H401,<br>H412<br>Concentration limits:<br>20 %: STOT SE 3, H336; | <= 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

After swallowing: caution if victim vomits. Risk of aspiration! Keep airways free. Pulmonary failure possible after aspiration of vomit. Call a physician immediately.

### 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**

Carbon dioxide (CO<sub>2</sub>) Foam 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.

Pay attention to flashback.

Vapors are heavier than air and may spread along floors.

Development of hazardous combustion gases or vapours possible in the event of fire.

Forms explosive mixtures with air at ambient temperatures.

### 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. Risk of explosion.

### 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. Chemisorb®). 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 safe handling**

Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

#### **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

Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition.

Handle and store under inert gas.

### Storage class

Storage class (TRGS 510): 3: Flammable liquids

## 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                                                              |
|-----------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|--------------------------------------------------------------------|
| Toluene   | 108-88-3 | TWA                                                                                                                                                                                                              | 100 ppm<br>375 mg/m <sup>3</sup> | USA. Table Z-1-A Limits for Air Contaminants (1989 vacated values) |
|           |          | STEL                                                                                                                                                                                                             | 150 ppm<br>560 mg/m <sup>3</sup> | USA. Table Z-1-A Limits for Air Contaminants (1989 vacated values) |
|           |          | TWA                                                                                                                                                                                                              | 200 ppm                          | USA. Occupational Exposure Limits (OSHA) - Table Z-2               |
|           | Remarks  | Z37.12-1967                                                                                                                                                                                                      |                                  |                                                                    |
|           |          | CEIL                                                                                                                                                                                                             | 300 ppm                          | USA. Occupational Exposure Limits (OSHA) - Table Z-2               |
|           |          | Z37.12-1967                                                                                                                                                                                                      |                                  |                                                                    |
|           |          | Peak                                                                                                                                                                                                             | 500 ppm                          | USA. Occupational Exposure Limits (OSHA) - Table Z-2               |
|           |          | Z37.12-1967                                                                                                                                                                                                      |                                  |                                                                    |
|           |          | TWA                                                                                                                                                                                                              | 20 ppm                           | USA. ACGIH Threshold Limit Values (TLV)                            |
|           |          | Visual impairment<br>Female reproductive<br>Pregnancy loss<br>2022 Adoption<br>Substances for which there is a Biological Exposure Index or Indices (see BEI® section)<br>Not classifiable as a human carcinogen |                                  |                                                                    |

|  |  |     |                                  |                                           |
|--|--|-----|----------------------------------|-------------------------------------------|
|  |  | TWA | 100 ppm<br>375 mg/m <sup>3</sup> | USA. NIOSH Recommended<br>Exposure Limits |
|  |  | ST  | 150 ppm<br>560 mg/m <sup>3</sup> | USA. NIOSH Recommended<br>Exposure Limits |

#### Biological occupational exposure limits

| Component | CAS-No.  | Parameters                                               | Value              | Biological specimen | Basis                                     |
|-----------|----------|----------------------------------------------------------|--------------------|---------------------|-------------------------------------------|
| Toluene   | 108-88-3 | Toluene                                                  | 0.02 mg/l          | In blood            | ACGIH - Biological Exposure Indices (BEI) |
|           | Remarks  | Prior to last shift of workweek                          |                    |                     |                                           |
|           |          | Toluene                                                  | 0.03 mg/l          | Urine               | ACGIH - Biological Exposure Indices (BEI) |
|           |          | End of shift (As soon as possible after exposure ceases) |                    |                     |                                           |
|           |          | o-Cresol                                                 | 0.3mg/g creatinine | Urine               | ACGIH - Biological Exposure Indices (BEI) |
|           |          | End of shift (As soon as possible after exposure ceases) |                    |                     |                                           |

#### Derived No Effect Level (DNEL)

| Application Area | Routes of exposure | Health effect              | Value                  |
|------------------|--------------------|----------------------------|------------------------|
| Workers          | Inhalation         | Acute systemic effects     | 384 mg/m <sup>3</sup>  |
| Workers          | Inhalation         | Acute local effects        | 384 mg/m <sup>3</sup>  |
| Workers          | Skin contact       | Long-term systemic effects | 384mg/kg BW/d          |
| Workers          | Inhalation         | Long-term systemic effects | 192 mg/m <sup>3</sup>  |
| Workers          | Inhalation         | Long-term local effects    | 192 mg/m <sup>3</sup>  |
| Consumers        | Inhalation         | Acute systemic effects     | 226 mg/m <sup>3</sup>  |
| Consumers        | Inhalation         | Acute local effects        | 226 mg/m <sup>3</sup>  |
| Consumers        | Skin contact       | Long-term systemic effects | 226mg/kg BW/d          |
| Consumers        | Inhalation         | Long-term systemic effects | 56.5 mg/m <sup>3</sup> |
| Consumers        | Ingestion          | Long-term systemic effects | 8.13mg/kg BW/d         |

#### Predicted No Effect Concentration (PNEC)

| Compartment                  | Value       |
|------------------------------|-------------|
| Soil                         | 2.89 mg/kg  |
| Sea water                    | 0.68 mg/l   |
| Fresh water                  | 0.68 mg/l   |
| Sea sediment                 | 16.39 mg/kg |
| Fresh water sediment         | 16.39 mg/kg |
| Sewage treatment plant       | 13.61 mg/l  |
| Aquatic intermittent release | 0.68 mg/l   |

## 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

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 EN 16523-1 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: Viton®

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

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 EN 16523-1 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: Viton®

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

#### Body Protection

Flame retardant antistatic protective clothing.

#### Respiratory protection

Recommended Filter type: Filter A (acc. to DIN 3181) for vapours of organic compounds

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer.

These measures have to be properly documented.

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. Risk of explosion.

---

## SECTION 9: Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

|                                                 |                                                                    |
|-------------------------------------------------|--------------------------------------------------------------------|
| a) Appearance                                   | Form: liquid                                                       |
| b) Odor                                         | benzene-like                                                       |
| c) Odor Threshold                               | 0.2 ppm                                                            |
| d) pH                                           | Not applicable                                                     |
| e) Melting point/freezing point                 | Melting point/range: -93 °C (-135 °F)                              |
| f) Initial boiling point and boiling range      | 110 - 111 °C 230 - 232 °F                                          |
| g) Flash point                                  | 4.4 °C (39.9 °F) - closed cup                                      |
| h) Evaporation rate                             | No data available                                                  |
| i) Flammability (solid, gas)                    | No data available                                                  |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 7.1 %(V)<br>Lower explosion limit: 1.2 %(V) |
| k) Vapor pressure                               | 30.88 hPa at 21.1 °C (70.0 °F)                                     |
| l) Vapor density                                | 3.18                                                               |
| m) Density                                      | 0.865 g/mL at 25 °C (77 °F)                                        |
| Relative density                                | 0.8720 °C                                                          |
| n) Water solubility                             | 0.58 g/l at 25 °C (77 °F) - partly soluble                         |
| o) Partition coefficient: n-octanol/water       | log Pow: 2.73 at 20 °C (68 °F) - Bioaccumulation is not expected.  |
| p) Autoignition temperature                     | 535.0 °C (995.0 °F)                                                |
| q) Decomposition temperature                    | No data available                                                  |
| r) Viscosity                                    | No data available                                                  |
| s) Explosive properties                         | No data available                                                  |
| t) Oxidizing properties                         | none                                                               |

### 9.2 Other safety information

|                        |                                         |
|------------------------|-----------------------------------------|
| Conductivity           | < 0.01 µS/cm                            |
| Surface tension        | 27.73 mN/m at 0.516g/l at 25 °C (77 °F) |
| Relative vapor density | 3.18                                    |

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

Vapors may form explosive mixture with air.  
Vapors may form explosive mixture with air.

### 10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .  
The product is chemically stable under standard ambient conditions (room temperature) .

### 10.3 Possibility of hazardous reactions

Risk of explosion with:  
fuming sulfuric acid  
Nitric acid  
silver  
perchlorates  
nitrogen dioxide  
nonmetallic halides  
halogen-halogen compounds  
uranium hexafluoride  
organic nitro compounds  
Violent reactions possible with:  
Strong acids  
Strong oxidizing agents  
sulfur  
with  
Heat.

### 10.4 Conditions to avoid

Warming.  
Warming.

### 10.5 Incompatible materials

rubber, various plastics

### 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 - 5,580 mg/kg  
(Tested according to Directive 92/69/EEC.)  
LC50 Inhalation - Rat - male and female - 4 h - 25.7 mg/l - vapor

(OECD Test Guideline 403)  
LD50 Dermal - Rabbit - > 5,000 mg/kg  
Remarks: (ECHA)  
No data available

**Skin corrosion/irritation**

Skin - Rabbit

Result: irritating - 4 h

Remarks: (ECHA)

**Serious eye damage/eye irritation**

Eyes - Rabbit

Result: slight irritation

(OECD Test Guideline 405)

**Respiratory or skin sensitization**

Maximization Test - Guinea pig

Result: negative

(Regulation (EC) No. 440/2008, Annex, B.6)

**Germ cell mutagenicity**

Test Type: In vitro mammalian cell gene mutation test

Test system: Mouse lymphoma test

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 476

Result: negative

Test Type: Ames test

Test system: *S. typhimurium*

Metabolic activation: with and without metabolic activation

Method: Mutagenicity (*Salmonella typhimurium* - reverse mutation assay)

Result: negative

Test Type: Chromosome aberration test

Species: Rat

Cell type: Bone marrow

Application Route: i.p.

Result: negative

Remarks: (ECHA)

**Carcinogenicity**

No data available

IARC: No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

**Reproductive toxicity**

Suspected of damaging the unborn child.

**Specific target organ toxicity - single exposure**

May cause drowsiness or dizziness. - Central nervous system

**Specific target organ toxicity - repeated exposure**

May cause damage to organs through prolonged or repeated exposure.

- Central nervous system

### Aspiration hazard

Aspiration hazard, Aspiration may cause pulmonary edema and pneumonitis.

## 11.2 Additional Information

RTECS: XS5250000

Drowsiness, irritant effects, Dizziness, Convulsions, Headache, Nausea, Vomiting, Circulatory collapse, somnolence, inebriation, Unconsciousness, respiratory arrest, CNS disorders, respiratory paralysis, death

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

Stomach - Irregularities - Based on Human Evidence

---

## SECTION 12: Ecological information

### 12.1 Toxicity

|                  |                                                                                                  |
|------------------|--------------------------------------------------------------------------------------------------|
| Toxicity to fish | flow-through test LC50 - Oncorhynchus kisutch (coho salmon) - 5.5 mg/l - 96 h<br>Remarks: (ECHA) |
|------------------|--------------------------------------------------------------------------------------------------|

|                                                     |                                                                    |
|-----------------------------------------------------|--------------------------------------------------------------------|
| Toxicity to daphnia and other aquatic invertebrates | EC50 - Ceriodaphnia dubia (water flea) - 3.78 mg/l - 48 h (US-EPA) |
|-----------------------------------------------------|--------------------------------------------------------------------|

|                      |                                                                 |
|----------------------|-----------------------------------------------------------------|
| Toxicity to bacteria | static test EC50 - Bacteria - 84 mg/l - 24 h<br>Remarks: (ECHA) |
|----------------------|-----------------------------------------------------------------|

|                                    |                                                                                                   |
|------------------------------------|---------------------------------------------------------------------------------------------------|
| Toxicity to fish(Chronic toxicity) | flow-through test NOEC - Oncorhynchus kisutch (coho salmon) - 1.39 mg/l - 40 d<br>Remarks: (ECHA) |
|------------------------------------|---------------------------------------------------------------------------------------------------|

|                                                                       |                                                                   |
|-----------------------------------------------------------------------|-------------------------------------------------------------------|
| Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity) | NOEC - Ceriodaphnia dubia (water flea) - 0.74 mg/l - 7 d (US-EPA) |
|-----------------------------------------------------------------------|-------------------------------------------------------------------|

### 12.2 Persistence and degradability

|                  |                                                                                            |
|------------------|--------------------------------------------------------------------------------------------|
| Biodegradability | aerobic - Exposure time 20 d<br>Result: 86 % - Readily biodegradable.<br>Remarks: (IUCLID) |
|------------------|--------------------------------------------------------------------------------------------|

### 12.3 Bioaccumulative potential

|                 |                                                            |
|-----------------|------------------------------------------------------------|
| Bioaccumulation | Leuciscus idus (Golden orfe) - 3 d<br>- 0.05 mg/l(Toluene) |
|-----------------|------------------------------------------------------------|

Bioconcentration factor (BCF): 90

### 12.4 Mobility in soil

No data available

Sigma-Aldrich - 244511

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## 12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

## 12.6 Endocrine disrupting properties

No data available

## 12.7 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.

---

## SECTION 14: Transport information

#### DOT (US)

UN number: 1294    Class: 3    Packing group: II  
Proper shipping name: Toluene  
Reportable Quantity (RQ): 1000 lbs  
Poison Inhalation Hazard: No

#### IMDG

UN number: 1294    Class: 3    Packing group: II    EMS-No: F-E, S-D  
Proper shipping name: TOLUENE

#### IATA

UN number: 1294    Class: 3    Packing group: II  
Proper shipping name: Toluene

---

## 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 |
|---------|----------|---------------|
| Toluene | 108-88-3 | 2007-07-01    |

### SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard



### Massachusetts Right To Know Components

|         |                     |                             |
|---------|---------------------|-----------------------------|
| Toluene | CAS-No.<br>108-88-3 | Revision Date<br>2007-07-01 |
|---------|---------------------|-----------------------------|

### Pennsylvania Right To Know Components

|         |                     |                             |
|---------|---------------------|-----------------------------|
| Toluene | CAS-No.<br>108-88-3 | Revision Date<br>2007-07-01 |
|---------|---------------------|-----------------------------|

### California Prop. 65 Components

|                                                                                                                                                                                                    |                     |                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------------------------|
| , which is/are known to the State of California to cause birth defects or other reproductive harm. For more information go to <a href="http://www.P65Warnings.ca.gov">www.P65Warnings.ca.gov</a> . | CAS-No.<br>108-88-3 | Revision Date<br>2009-02-01 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------------------------|

---

## 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: 6.21

Revision Date: 08/23/2023

Print Date: 08/23/2023

## SAFETY DATA SHEET

Version 6.3  
Revision Date 05/27/2021  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : 1,2-Dichloroethylene, mixture of *cis* and *trans*

Product Number : D62403

Brand : Aldrich

Index-No. : 602-026-00-3

CAS-No. : 540-59-0

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

Company : Sigma-Aldrich 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 2), H225

Acute toxicity, Inhalation (Category 4), H332

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)        |                                                                                                                             |
| H225                       | Highly flammable liquid and vapor.                                                                                          |
| H332                       | Harmful if inhaled.                                                                                                         |
| H412                       | Harmful to aquatic life with long lasting effects.                                                                          |
| Precautionary statement(s) |                                                                                                                             |
| P210                       | Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.                                                         |
| P233                       | Keep container tightly closed.                                                                                              |
| P240                       | Ground/bond container and receiving equipment.                                                                              |
| P241                       | Use explosion-proof electrical/ ventilating/ lighting/ equipment.                                                           |
| P242                       | Use only non-sparking tools.                                                                                                |
| P243                       | Take precautionary measures against static discharge.                                                                       |
| P261                       | Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray.                                                                       |
| P271                       | Use only outdoors or in a well-ventilated area.                                                                             |
| P273                       | Avoid release to the environment.                                                                                           |
| P280                       | Wear protective gloves/ eye protection/ face protection.                                                                    |
| P303 + P361 + P353         | IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.                        |
| P304 + P340 + P312         | IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell. |
| P370 + P378                | In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.                                        |
| P403 + P235                | Store in a well-ventilated place. Keep cool.                                                                                |
| P501                       | Dispose of contents/ container to an approved waste disposal plant.                                                         |

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

|                  |                                                 |
|------------------|-------------------------------------------------|
| Formula          | : C <sub>2</sub> H <sub>2</sub> Cl <sub>2</sub> |
| Molecular weight | : 96.94 g/mol                                   |
| CAS-No.          | : 540-59-0                                      |
| EC-No.           | : 208-750-2                                     |
| Index-No.        | : 602-026-00-3                                  |

| Component                   | Classification                                                  | Concentration |
|-----------------------------|-----------------------------------------------------------------|---------------|
| <b>1,2-Dichloroethylene</b> |                                                                 |               |
|                             | Flam. Liq. 2; Acute Tox. 4; Aquatic Chronic 3; H225, H332, H412 | <= 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. If breathing stops: mouth-to-mouth breathing or artificial respiration. Oxygen if necessary. Immediately call in physician.

**In case of skin contact**

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

**In case of eye contact**

After eye contact: rinse out with plenty of water. Remove contact lenses.

**If swallowed**

After swallowing: make victim drink water (two glasses at most). Consult doctor if feeling unwell.

**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.

Pay attention to flashback.

Vapors are heavier than air and may spread along floors.

Risk of dust explosion.

Development of hazardous combustion gases or vapours possible in the event of fire.

Forms explosive mixtures with air at ambient temperatures.

**5.3 Advice for firefighters**

In the event of fire, wear self-contained breathing apparatus.

**5.4 Further information**

Remove container from danger zone and cool with water. Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

---

**SECTION 6: Accidental release measures****6.1 Personal precautions, protective equipment and emergency procedures**

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. 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. Risk of explosion.

## **6.3 Methods and materials for containment and cleaning up**

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent material (e.g. Chemizorb® ). Dispose of properly. Clean up affected area.

## **6.4 Reference to other sections**

For disposal see section 13.

---

## **SECTION 7: Handling and storage**

### **7.1 Precautions for safe handling**

#### **Advice on safe handling**

Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

#### **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**

Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.

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. Keep away from heat and sources of ignition.

Air, light, and moisture sensitive.

Storage class (TRGS 510): 3: Flammable liquids

### **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                                                                                   |
|----------------------|----------|-------|----------------------|-----------------------------------------------------------------------------------------|
| 1,2-Dichloroethylene | 540-59-0 | TWA   | 200 ppm<br>790 mg/m3 | USA. NIOSH Recommended Exposure Limits                                                  |
|                      |          | TWA   | 200 ppm<br>790 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|                      |          | PEL   | 200 ppm<br>790 mg/m3 | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|                      |          | TWA   | 200 ppm              | USA. ACGIH Threshold Limit Values (TLV)                                                 |

## 8.2 Exposure controls

### Appropriate engineering controls

Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.

### Personal protective equipment

#### Eye/face protection

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

#### Skin protection

required

#### Body Protection

Flame retardant antistatic 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. Risk of explosion.

---

## SECTION 9: Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

- |                                            |                                             |
|--------------------------------------------|---------------------------------------------|
| a) Appearance                              | Form: liquid<br>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: -57 °C (-71 °F) - lit. |
| f) Initial boiling point and boiling range | 48 - 60 °C 118 - 140 °F - lit.              |

|                                                 |                           |
|-------------------------------------------------|---------------------------|
| g) Flash point                                  | 6 °C (43 °F) - closed cup |
| h) Evaporation rate                             | No data available         |
| i) Flammability (solid, gas)                    | No data available         |
| j) Upper/lower flammability or explosive limits | No data available         |
| k) 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

Vapors may form explosive mixture with air.

### 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

Warming.

### 10.5 Incompatible materials

Strong oxidizing agents, 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

Oral: No data available

Acute toxicity estimate Inhalation - 4 h - 11.1 mg/l

(Expert judgment)

Inhalation: No data available

Dermal: No data available

No data available

#### Skin corrosion/irritation

Skin - Rabbit

#### 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

### 11.2 Additional Information

RTECS: KV9360000

prolonged or repeated exposure can cause:, narcosis, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence



---

## SECTION 12: Ecological information

### 12.1 Toxicity

No data available

### 12.2 Persistence and degradability

No data available

### 12.3 Bioaccumulative potential

No data available

### 12.4 Mobility in soil

No data available

### 12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

### 12.6 Other adverse effects

No data available

---

## SECTION 13: Disposal considerations

### 13.1 Waste treatment methods

#### Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See [www.retrologistik.com](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: 1150    Class: 3    Packing group: II  
Proper shipping name: 1,2-Dichloroethylene  
Reportable Quantity (RQ):  
Poison Inhalation Hazard: No

### IMDG

UN number: 1150    Class: 3    Packing group: II    EMS-No: F-E, S-D  
Proper shipping name: 1,2-DICHLOROETHYLENE

### IATA

UN number: 1150    Class: 3    Packing group: II  
Proper shipping name: 1,2-Dichloroethylene

---

## 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:

1,2-Dichloroethylene

CAS-No.  
540-59-0

Revision Date  
2007-07-01

#### **SARA 311/312 Hazards**

Fire Hazard, 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**

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: 05/27/2021

Print Date: 10/07/2023

## SAFETY DATA SHEET

Version 8.8  
Revision Date 03/18/2023  
Print Date 10/09/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Trichloroethylene

Product Number : 133124

Brand : Aldrich

Index-No. : 602-027-00-9

CAS-No. : 79-01-6

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

Company : Sigma-Aldrich Inc.  
3050 SPRUCE ST  
ST. LOUIS MO 63103  
UNITED STATES

Telephone : +1 314 771-5765

Fax : +1 800 325-5052

**1.4 Emergency telephone**

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-  
527-3887 CHEMTREC (International) 24  
Hours/day; 7 Days/week

**SECTION 2: Hazards identification****2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Skin irritation (Category 2), H315

Eye irritation (Category 2A), H319

Skin sensitization (Category 1), H317

Germ cell mutagenicity (Category 2), H341

Carcinogenicity (Category 1B), H350

Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336

Short-term (acute) aquatic hazard (Category 3), H402

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)

|      |                                                    |
|------|----------------------------------------------------|
| H315 | Causes skin irritation.                            |
| H317 | May cause an allergic skin reaction.               |
| H319 | Causes serious eye irritation.                     |
| H336 | May cause drowsiness or dizziness.                 |
| H341 | Suspected of causing genetic defects.              |
| H350 | May cause cancer.                                  |
| H412 | Harmful to aquatic life with long lasting effects. |

Precautionary statement(s)

|                    |                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------|
| P201               | Obtain special instructions before use.                                                                                          |
| P202               | Do not handle until all safety precautions have been read and understood.                                                        |
| P261               | Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray.                                                                            |
| P264               | Wash skin thoroughly after handling.                                                                                             |
| P271               | Use only outdoors or in a well-ventilated area.                                                                                  |
| P272               | Contaminated work clothing must not be allowed out of the workplace.                                                             |
| P273               | Avoid release to the environment.                                                                                                |
| P280               | Wear protective gloves/ protective clothing/ eye protection/ face protection.                                                    |
| P302 + P352        | IF ON SKIN: Wash with plenty of soap and water.                                                                                  |
| P304 + P340 + P312 | IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.      |
| P305 + P351 + P338 | IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. |
| P308 + P313        | IF exposed or concerned: Get medical advice/ attention.                                                                          |
| P333 + P313        | If skin irritation or rash occurs: Get medical advice/ attention.                                                                |
| P337 + P313        | If eye irritation persists: Get medical advice/ attention.                                                                       |
| P362               | Take off contaminated clothing and wash before reuse.                                                                            |
| P403 + P233        | Store in a well-ventilated place. Keep container tightly closed.                                                                 |
| P405               | Store locked up.                                                                                                                 |
| P501               | Dispose of contents/ container to an approved waste disposal plant.                                                              |

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

---

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

|                  |   |                                 |
|------------------|---|---------------------------------|
| Synonyms         | : | TCE<br>Trichloroethene          |
| Formula          | : | C <sub>2</sub> HCl <sub>3</sub> |
| Molecular weight | : | 131.39 g/mol                    |
| CAS-No.          | : | 79-01-6                         |
| EC-No.           | : | 201-167-4                       |
| Index-No.        | : | 602-027-00-9                    |

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| Component                | Classification                                                                                                                                                                                                                          | Concentration |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>trichloroethylene</b> |                                                                                                                                                                                                                                         |               |
|                          | Skin Irrit. 2; Eye Irrit. 2A;<br>Skin Sens. 1; Muta. 2;<br>Carc. 1B; STOT SE 3;<br>Aquatic Acute 3; Aquatic<br>Chronic 3; H315, H319,<br>H317, H341, H350, H336,<br>H402, H412<br>Concentration limits:<br>>= 20 %: STOT SE 3,<br>H336; | <= 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

After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

#### Suitable extinguishing media

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

Not combustible.

Ambient fire may liberate hazardous vapours.

### **5.3 Advice for firefighters**

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

### **5.4 Further information**

Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

---

## **SECTION 6: Accidental release measures**

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

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.

For personal protection see section 8.

### **6.2 Environmental precautions**

Do not let product enter drains.

### **6.3 Methods and materials for containment and cleaning up**

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up 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 safe handling**

Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

#### **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.

Light sensitive. Handle and store under inert gas.

#### **Storage class**

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

| Component         | CAS-No. | Value                             | Control parameters   | Basis                                                                                   |
|-------------------|---------|-----------------------------------|----------------------|-----------------------------------------------------------------------------------------|
| trichloroethylene | 79-01-6 | TWA                               | 10 ppm               | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|                   | Remarks | Suspected human carcinogen        |                      |                                                                                         |
|                   |         | STEL                              | 25 ppm               | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|                   |         | Suspected human carcinogen        |                      |                                                                                         |
|                   |         | Potential Occupational Carcinogen |                      |                                                                                         |
|                   |         | TWA                               | 100 ppm              | USA. Occupational Exposure Limits (OSHA) - Table Z-2                                    |
|                   |         | CEIL                              | 200 ppm              | USA. Occupational Exposure Limits (OSHA) - Table Z-2                                    |
|                   |         | Peak                              | 300 ppm              | USA. Occupational Exposure Limits (OSHA) - Table Z-2                                    |
|                   |         | C                                 | 300 ppm              | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|                   |         | PEL                               | 25 ppm<br>135 mg/m3  | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|                   |         | STEL                              | 100 ppm<br>537 mg/m3 | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |

#### Biological occupational exposure limits

| Component         | CAS-No. | Parameters                      | Value    | Biological specimen | Basis                                     |
|-------------------|---------|---------------------------------|----------|---------------------|-------------------------------------------|
| trichloroethylene | 79-01-6 | Trichloroacetic acid            | 15 mg/l  | Urine               | ACGIH - Biological Exposure Indices (BEI) |
|                   | Remarks | End of shift at end of workweek |          |                     |                                           |
|                   |         | Trichloroethanol                | 0.5 mg/l | In blood            | ACGIH - Biological Exposure Indices (BEI) |
|                   |         | End of shift at end of workweek |          |                     |                                           |
|                   |         | Trichloroethylene               |          | In blood            | ACGIH - Biological Exposure Indices (BEI) |
|                   |         | End of shift at end of workweek |          |                     |                                           |

|  |  |                                 |  |                    |                                           |
|--|--|---------------------------------|--|--------------------|-------------------------------------------|
|  |  | Trichloroethylene               |  | In end-exhaled air | ACGIH - Biological Exposure Indices (BEI) |
|  |  | End of shift at end of workweek |  |                    |                                           |

## 8.2 Exposure controls

### Appropriate engineering controls

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: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the 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 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, clear<br>Color: colorless                                                                                                                      |
| b) Odor                                         | characteristic                                                                                                                                               |
| c) Odor Threshold                               | 28 ppm                                                                                                                                                       |
| d) pH                                           | No data available                                                                                                                                            |
| e) Melting point/freezing point                 | Melting point/range: -84.8 °C (-120.6 °F) - lit.                                                                                                             |
| f) Initial boiling point and boiling range      | 86.7 °C 188.1 °F - lit.                                                                                                                                      |
| g) Flash point                                  | ( ) - closed cup does not flash                                                                                                                              |
| h) Evaporation rate                             | No data available                                                                                                                                            |
| i) Flammability (solid, gas)                    | No data available                                                                                                                                            |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: > 99 %(V) - (Saturation - at high volume fractions, explosion turns into a decomposition reaction)<br>Lower explosion limit: 7.9 %(V) |
| k) Vapor pressure                               | 81.3 hPa at 20.0 °C (68.0 °F)                                                                                                                                |
| l) Vapor density                                | No data available                                                                                                                                            |
| m) Density                                      | 1.463 g/mL at 25 °C (77 °F) - lit.                                                                                                                           |
| Relative density                                | 1.4620 °C                                                                                                                                                    |
| n) Water solubility                             | 1.1 g/l at 20 °C (68 °F)                                                                                                                                     |
| o) Partition coefficient: n-octanol/water       | log Pow: 2.53 at 20 °C (68 °F) - Bioaccumulation is not expected.                                                                                            |
| p) Autoignition temperature                     | 410.0 °C (770.0 °F)                                                                                                                                          |
| q) Decomposition temperature                    | No data available                                                                                                                                            |
| r) Viscosity                                    | No data available                                                                                                                                            |
| s) Explosive properties                         | No data available                                                                                                                                            |
| t) Oxidizing properties                         | No data available                                                                                                                                            |

### 9.2 Other safety information

No data available

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

No data available

## 10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

## 10.3 Possibility of hazardous reactions

Violent reactions possible with:

Oxygen

(as liquefied gas)

Alkaline earth metals

alkali amides

semimetallic hydrogen compounds

perchloric acid

Light metals

aluminium chloride

Strong oxidizing agents

potassium nitrate

Risk of explosion with:

Alkali metals

Aluminum

Barium

alkali hydroxides

Lithium

magnesium

Powdered metals

sodium amide

Strong oxidizing agents

nitrogen dioxide

Boranes

Oxygen

with

alkali hydroxides

Oxygen

with

Pressure

Risk of ignition or formation of inflammable gases or vapours with:

Titanium

Beryllium

Epoxy constituents

## 10.4 Conditions to avoid

no information available

## 10.5 Incompatible materials

various plastics

## 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

Oral: No data available

LC50 Inhalation - Rat - male - 4 h - 67.41 mg/l

Remarks: (ECHA)  
LD50 Dermal - Rabbit - > 20,000 mg/kg  
No data available

#### **Skin corrosion/irritation**

Skin - Rabbit  
Result: Skin irritation  
(OECD Test Guideline 404)

#### **Serious eye damage/eye irritation**

Eyes - Rabbit  
Result: Eye irritation - 24 h  
Remarks: (RTECS)

#### **Respiratory or skin sensitization**

Local lymph node assay (LLNA) - Mouse  
Result: positive  
(OECD Test Guideline 429)

#### **Germ cell mutagenicity**

In vitro tests showed mutagenic effects  
Test Type: Ames test  
Test system: *S. typhimurium*  
Method: OECD Test Guideline 471  
Result: negative  
Test Type: In vitro mammalian cell gene mutation test  
Test system: mouse lymphoma cells  
Metabolic activation: with and without metabolic activation  
Method: OECD Test Guideline 476  
Result: negative  
Test Type: Chromosome aberration test in vitro  
Test system: Chinese hamster ovary cells  
Metabolic activation: with and without metabolic activation  
Result: negative  
Remarks: (ECHA)

Test Type: in vivo assay  
Species: Mouse

Result: negative  
Remarks: (ECHA)

#### **Carcinogenicity**

Possible human carcinogen

IARC: 1 - Group 1: Carcinogenic to humans (trichloroethylene)  
NTP: Known - Known to be human carcinogen (trichloroethylene)  
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**

May cause drowsiness or dizziness. - Central nervous system

**Specific target organ toxicity - repeated exposure**

No data available

**Aspiration hazard**

No data available

**11.2 Additional Information**

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, Exposure to and/or consumption of alcohol may increase toxic effects., Gastrointestinal disturbance, Kidney injury may occur., narcosis  
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

---

**SECTION 12: Ecological information****12.1 Toxicity**

|                                                     |                                                                                                                     |
|-----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Toxicity to fish                                    | flow-through test LC50 - <i>Jordanella floridae</i> - 28.3 mg/l - 96 h (US-EPA)                                     |
| Toxicity to daphnia and other aquatic invertebrates | Remarks: No data available (trichloroethylene)                                                                      |
| Toxicity to algae                                   | ErC50 - <i>Chlamydomonas reinhardtii</i> (green algae) - 36.5 mg/l - 72 h<br>Remarks: (ECHA)<br>(trichloroethylene) |
| Toxicity to bacteria                                |                                                                                                                     |
| Toxicity to fish(Chronic toxicity)                  | flow-through test NOEC - <i>Jordanella floridae</i> (flagfish) - 5.76 mg/l - 10 d<br>Remarks: (ECHA)                |

**12.2 Persistence and degradability**

|                  |                                                                                                         |
|------------------|---------------------------------------------------------------------------------------------------------|
| Biodegradability | aerobic - Exposure time 28 d<br>Result: 19 % - Not readily biodegradable.<br>(OECD Test Guideline 301D) |
|------------------|---------------------------------------------------------------------------------------------------------|

**12.3 Bioaccumulative potential**

|                 |                                                          |
|-----------------|----------------------------------------------------------|
| Bioaccumulation | <i>Lepomis macrochirus</i> - 14 d<br>(trichloroethylene) |
|                 | Bioconcentration factor (BCF): 17                        |

**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 Endocrine disrupting properties**

No data available

**12.7 Other adverse effects**

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

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Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

---

## 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: 1710    Class: 6.1    Packing group: III  
Proper shipping name: Trichloroethylene  
Reportable Quantity (RQ): 100 lbs  
Reportable Quantity (RQ): 100 lbs  
Poison Inhalation Hazard: No

#### IMDG

UN number: 1710    Class: 6.1    Packing group: III    EMS-No: F-A, S-A  
Proper shipping name: TRICHLOROETHYLENE

#### IATA

UN number: 1710    Class: 6.1    Packing group: III  
Proper shipping name: Trichloroethylene

---

## 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 |
|-------------------|---------|---------------|
| trichloroethylene | 79-01-6 | 2007-07-01    |

#### SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard  
:

**Reportable Quantity**      D040 lbs

#### Massachusetts Right To Know Components

|                   | CAS-No. | Revision Date |
|-------------------|---------|---------------|
| trichloroethylene | 79-01-6 | 2007-07-01    |

**Pennsylvania Right To Know Components**

trichloroethylene

CAS-No.  
79-01-6Revision Date  
2007-07-01**California Prop. 65 Components**

, which is/are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov.trichloroethylene](http://www.P65Warnings.ca.gov.trichloroethylene)

CAS-No.  
79-01-6Revision Date  
2017-04-11

---

**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: 8.8

Revision Date: 03/18/2023

Print Date: 10/09/2023

## SAFETY DATA SHEET

Version 6.11  
Revision Date 08/23/2023  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Vanadium(V) oxide

Product Number : 223794  
Brand : Aldrich  
Index-No. : 023-001-00-8  
CAS-No. : 1314-62-1

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

Identified uses : Laboratory chemicals, 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 2), H330  
Germ cell mutagenicity (Category 2), H341  
Carcinogenicity (Category 1B), H350  
Reproductive toxicity (Category 2), H361  
Effects on or via lactation, H362  
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335  
Specific target organ toxicity - repeated exposure, Inhalation (Category 1), Respiratory Tract, H372  
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 | Toxic if swallowed.                                                                            |
| H330 | Fatal if inhaled.                                                                              |
| H335 | May cause respiratory irritation.                                                              |
| H341 | Suspected of causing genetic defects.                                                          |
| H350 | May cause cancer.                                                                              |
| H361 | Suspected of damaging fertility or the unborn child.                                           |
| H362 | May cause harm to breast-fed children.                                                         |
| H372 | Causes damage to organs (Respiratory Tract) through prolonged or repeated exposure if inhaled. |
| H411 | Toxic to aquatic life with long lasting effects.                                               |

Precautionary statement(s)

|                    |                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------|
| P201               | Obtain special instructions before use.                                                                              |
| P202               | Do not handle until all safety precautions have been read and understood.                                            |
| P260               | Do not breathe dust.                                                                                                 |
| 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.                                        |
| P284               | Wear respiratory protection.                                                                                         |
| P301 + P310 + P330 | IF SWALLOWED: Immediately call a POISON CENTER/ doctor. Rinse mouth.                                                 |
| P304 + P340 + P310 | IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor. |
| P308 + P313        | IF exposed or concerned: Get medical advice/ attention.                                                              |
| P391               | Collect spillage.                                                                                                    |
| P403 + P233        | Store in a well-ventilated place. Keep container tightly closed.                                                     |
| P405               | Store locked up.                                                                                                     |
| P501               | Dispose of contents/ container to an approved waste disposal plant.                                                  |

## 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

---

### SECTION 3: Composition/information on ingredients

#### 3.1 Substances

|          |   |                                                        |
|----------|---|--------------------------------------------------------|
| Synonyms | : | Divanadium pentaoxide<br>Pentaoxodivanadium<br>Vanadia |
|----------|---|--------------------------------------------------------|

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Formula : O<sub>5</sub>V<sub>2</sub>  
Molecular weight : 181.88 g/mol  
CAS-No. : 1314-62-1  
EC-No. : 215-239-8  
Index-No. : 023-001-00-8

| Component                 | Classification                                                                                                                                                | Concentration |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>vanadium pentoxide</b> |                                                                                                                                                               |               |
|                           | Acute Tox. 3; Acute Tox. 2; Muta. 2; Carc. 1B; Repr. 2; Lact. ; STOT SE 3; STOT RE 1; Aquatic Chronic 2; H301, H330, H341, H350, H361, H362, H335, H372, 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

First aiders need to protect themselves. Show this material safety data sheet to the doctor in attendance.

#### If inhaled

After inhalation: fresh air. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

#### In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

#### In case of eye contact

After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

#### If swallowed

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**

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

#### **Unsuitable extinguishing media**

For this substance/mixture no limitations of extinguishing agents are given.

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

Vanadium/vanadium oxides

Not combustible.

Ambient fire may liberate hazardous vapours.

### 5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

### 5.4 Further information

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                                                                                   |
|--------------------|-----------|--------------------------------------------------------------|------------------------|-----------------------------------------------------------------------------------------|
| vanadium pentoxide | 1314-62-1 | TWA                                                          | 0.05 mg/m <sup>3</sup> | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|                    | Remarks   | Confirmed animal carcinogen with unknown relevance to humans |                        |                                                                                         |
|                    |           | C                                                            | 0.1 mg/m <sup>3</sup>  | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|                    |           | C                                                            | 0.5 mg/m <sup>3</sup>  | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|                    |           | PEL                                                          | 0.05 mg/m <sup>3</sup> | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|                    |           | C                                                            | 0.05 mg/m <sup>3</sup> | USA. NIOSH Recommended Exposure Limits                                                  |
|                    |           | C                                                            | 0.05 mg/m <sup>3</sup> | USA. NIOSH Recommended Exposure Limits                                                  |
|                    |           | TWA                                                          | 0.05 mg/m <sup>3</sup> | USA. Table Z-1-A Limits for Air Contaminants (1989 vacated values)                      |
|                    |           | TWA                                                          | 0.05 mg/m <sup>3</sup> | USA. Table Z-1-A Limits for Air Contaminants (1989 vacated values)                      |

### 8.2 Exposure controls

#### Appropriate engineering controls

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

## Personal protective equipment

### Eye/face protection

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

### Skin protection

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 EN 16523-1 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

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 EN 16523-1 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: 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

Recommended Filter type: Filter type P3

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer.

These measures have to be properly documented.  
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 |

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|                                                 |                                                              |
|-------------------------------------------------|--------------------------------------------------------------|
| e) Melting point/freezing point                 | Melting point/range: 690 °C (1274 °F) - lit.                 |
| f) Initial boiling point and boiling range      | ca.1,750 °C ca.3,182 °F - (decomposition)                    |
| 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                                      | 3.35 g/cm <sup>3</sup> at 25 °C (77 °F) - lit.               |
| Relative density                                | 3.6521.7 °C - OECD Test Guideline 109                        |
| n) Water solubility                             | 515 g/l at 20 °C (68 °F) - OECD Test Guideline 105 - soluble |
| o) Partition coefficient: n-octanol/water       | Not applicable for inorganic substances                      |
| 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                                                         |

## 9.2 Other safety information

|                              |                     |
|------------------------------|---------------------|
| Solubility in other solvents | Ethanol - insoluble |
|------------------------------|---------------------|

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

### 10.3 Possibility of hazardous reactions

Exothermic reaction with:

Alkali metals

halogen-halogen compounds

Acids

Risk of explosion with:

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performic acid  
Risk of ignition or formation of inflammable gases or vapours with:  
Alkaline earth metals  
highly flammable solvents  
oxidisable substances  
sulfur  
(in the presence of atmospheric oxygen and/or moisture)

#### **10.4 Conditions to avoid**

no information available

#### **10.5 Incompatible materials**

No data available

#### **10.6 Hazardous decomposition products**

In the event of fire: see section 5

---

### **SECTION 11: Toxicological information**

#### **11.1 Information on toxicological effects**

##### **Acute toxicity**

Acute toxicity estimate Oral - 220 mg/kg

(Acute toxicity estimate according to Regulation (EC) No. 1272/2008)

Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Inhalation: Irritating to respiratory system.

Acute toxicity estimate Inhalation - 0.05 mg/l - dust/mist

(Acute toxicity estimate according to Regulation (EC) No. 1272/2008)

Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

LC50 Dermal - Rat - male and female - > 2,500 mg/kg

(OECD Test Guideline 402)

##### **Skin corrosion/irritation**

Skin - in vitro test

Result: No skin irritation - 15 min

Remarks: (ECHA)

##### **Serious eye damage/eye irritation**

No data available

##### **Respiratory or skin sensitization**

Maximization Test - Guinea pig

Result: negative

(OECD Test Guideline 406)

##### **Germ cell mutagenicity**

Suspected of causing genetic defects.

Test Type: Micronucleus test

Species: Mouse

Cell type: Red blood cells (erythrocytes)

Application Route: Inhalation

Method: OECD Test Guideline 474

Result: negative

Test Type: Transgenic rodent somatic cell gene mutation assay  
Species: Mouse

Application Route: Inhalation  
Method: OECD Test Guideline 488  
Result: negative

Test Type: comet assay  
Species: Mouse

Application Route: Inhalation

Result: negative  
Remarks: (ECHA)

### **Carcinogenicity**

Presumed to have carcinogenic potential for humans

IARC: 2B - Group 2B: Possibly carcinogenic to humans (vanadium pentoxide)

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

### **Reproductive toxicity**

Suspected of damaging the unborn child.

Suspected of damaging fertility.

Studies indicating a hazard to babies during the lactation period

### **Specific target organ toxicity - single exposure**

Inhalation - May cause respiratory irritation. - Respiratory Tract

Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

### **Specific target organ toxicity - repeated exposure**

Inhalation - Causes damage to organs through prolonged or repeated exposure.

- Respiratory Tract

Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

### **Aspiration hazard**

No data available

## **11.2 Additional Information**

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

Vanadium and its compounds generally cause irritations after eye and skin contact and mucosal irritations, coughing, and dyspnoea after inhalation. After absorption of toxic quantities changes in the blood picture, loss of weight, cardiovascular complaints.

Other dangerous properties can not be excluded.

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(Chronic toxicity)      Growth inhibition NOEC - Pimephales promelas (fathead minnow) - 0.24 mg/l - 28 d  
Remarks: (ECOTOX Database)

### 12.2 Persistence and degradability

The methods for determining biodegradability are not applicable to inorganic substances.

### 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 Endocrine disrupting properties

No data available

### 12.7 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.

---

## SECTION 14: Transport information

### DOT (US)

UN number: 2862    Class: 6.1    Packing group: III  
Proper shipping name: Vanadium pentoxide  
Reportable Quantity (RQ): 1000 lbs  
Poison Inhalation Hazard: No

### IMDG

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UN number: 2862    Class: 6.1    Packing group: III    EMS-No: F-A, S-A  
Proper shipping name: VANADIUM PENTOXIDE  
Marine pollutant : yes

**IATA**

UN number: 2862    Class: 6.1    Packing group: III  
Proper shipping name: Vanadium pentoxide

---

**SECTION 15: Regulatory information**

**SARA 302 Components**

|                    |                      |                             |
|--------------------|----------------------|-----------------------------|
| vanadium pentoxide | CAS-No.<br>1314-62-1 | Revision Date<br>1989-08-11 |
|--------------------|----------------------|-----------------------------|

**SARA 313 Components**

|                    |                      |                             |
|--------------------|----------------------|-----------------------------|
| vanadium pentoxide | CAS-No.<br>1314-62-1 | Revision Date<br>1989-08-11 |
|--------------------|----------------------|-----------------------------|

The following components are subject to reporting levels established by SARA Title III, Section 313:

|                    |                      |                             |
|--------------------|----------------------|-----------------------------|
| vanadium pentoxide | CAS-No.<br>1314-62-1 | Revision Date<br>1989-08-11 |
|--------------------|----------------------|-----------------------------|

**SARA 311/312 Hazards**

Acute Health Hazard, Chronic Health Hazard

**Massachusetts Right To Know Components**

|                    |                      |                             |
|--------------------|----------------------|-----------------------------|
| vanadium pentoxide | CAS-No.<br>1314-62-1 | Revision Date<br>1989-08-11 |
|--------------------|----------------------|-----------------------------|

**Pennsylvania Right To Know Components**

|                    |                      |                             |
|--------------------|----------------------|-----------------------------|
| vanadium pentoxide | CAS-No.<br>1314-62-1 | Revision Date<br>1989-08-11 |
|--------------------|----------------------|-----------------------------|

**California Prop. 65 Components**

|                                                                                                                                                                                                        |                      |                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------------|
| , which is/are known to the State of California to cause cancer. For more information go to <a href="http://www.P65Warnings.ca.gov.vanadium%20pentoxide">www.P65Warnings.ca.gov.vanadium pentoxide</a> | CAS-No.<br>1314-62-1 | Revision Date<br>2007-09-28 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------------|

---

**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

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Version: 6.11

Revision Date: 08/23/2023

Print Date: 10/07/2023

## SAFETY DATA SHEET

Version 8.8  
Revision Date 08/23/2023  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Vinyl chloride

Product Number : 387622  
Brand : Aldrich  
Index-No. : 602-023-00-7  
CAS-No. : 75-01-4

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

Company : Sigma-Aldrich 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 gases (Category 1), H220  
Gases under pressure (Liquefied gas), H280  
Carcinogenicity (Category 1A), H350

For the full text of the H-Statements mentioned in this Section, see Section 16.

**2.2 GHS Label elements, including precautionary statements**

Pictogram



Signal Word

Danger

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|                            |                                                                               |
|----------------------------|-------------------------------------------------------------------------------|
| Hazard statement(s)        |                                                                               |
| H220                       | Extremely flammable gas.                                                      |
| H280                       | Contains gas under pressure; may explode if heated.                           |
| H350                       | May cause cancer.                                                             |
| Precautionary statement(s) |                                                                               |
| P201                       | Obtain special instructions before use.                                       |
| P202                       | Do not handle until all safety precautions have been read and understood.     |
| P210                       | Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.           |
| P280                       | Wear protective gloves/ protective clothing/ eye protection/ face protection. |
| P308 + P313                | IF exposed or concerned: Get medical advice/ attention.                       |
| P377                       | Leaking gas fire: Do not extinguish, unless leak can be stopped safely.       |
| P381                       | Eliminate all ignition sources if safe to do so.                              |
| P405                       | Store locked up.                                                              |
| P410 + P403                | Protect from sunlight. Store in a well-ventilated place.                      |
| P501                       | Dispose of contents/ container to an approved waste disposal plant.           |

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

May form explosive peroxides.

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Synonyms : Chloroethylene

Formula :  $C_2H_3Cl$   
Molecular weight : 62.50 g/mol  
CAS-No. : 75-01-4  
EC-No. : 200-831-0  
Index-No. : 602-023-00-7

| Component             | Classification                                                    | Concentration |
|-----------------------|-------------------------------------------------------------------|---------------|
| <b>Vinyl chloride</b> |                                                                   |               |
|                       | Flam. Gas 1; Press. Gas Liquefied gas; Carc. 1A; H220, H280, H350 | <= 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.

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**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**

After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

**SECTION 5: Firefighting measures****5.1 Extinguishing media****Suitable extinguishing media**

Water Foam Carbon dioxide (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.

Pay attention to flashback.

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. Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

---

**SECTION 6: Accidental release measures****6.1 Personal precautions, protective equipment and emergency procedures**

Advice for non-emergency personnel: Do not breathe gas. Avoid substance contact.

Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.

For personal protection see section 8.

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## 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). Stop flow of gas, move leaking cylinder to open air if without risk.

## 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. Avoid generation of vapours/aerosols.

#### Advice on protection against fire and explosion

Keep away from open flames, hot surfaces and sources of ignition.

#### 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 locked up or in an area accessible only to qualified or authorized persons. Keep away from combustible materials and sources of ignition.

Contents under pressure. Light sensitive.

#### Storage class

Storage class (TRGS 510): 2A: Gases

### 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                                                              |
|----------------|---------|-----------------------------------------------------------|--------------------|--------------------------------------------------------------------|
| Vinyl chloride | 75-01-4 | TWA                                                       | 1 ppm              | USA. Table Z-1-A Limits for Air Contaminants (1989 vacated values) |
|                |         | TWA                                                       | 1 ppm              | USA. ACGIH Threshold Limit Values (TLV)                            |
|                | Remarks | Liver damage<br>Lung cancer<br>Confirmed human carcinogen |                    |                                                                    |

|  |  |                                                     |       |                                                                                  |
|--|--|-----------------------------------------------------|-------|----------------------------------------------------------------------------------|
|  |  | STEL                                                | 5 ppm | USA. Table Z-1-A Limits for Air Contaminants (1989 vacated values)               |
|  |  | TWA                                                 | 1 ppm | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
|  |  | STEL                                                | 5 ppm | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
|  |  | See 1910.1017                                       |       |                                                                                  |
|  |  | Potential Occupational Carcinogen<br>See Appendix A |       |                                                                                  |

## 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

#### Body Protection

Flame retardant antistatic protective clothing.

#### Respiratory protection

Recommended Filter type: Filter type ABEK

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer.

These measures have to be properly documented.

required when vapours/mists 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: Liquefied gas<br>Color: colorless           |
| b) Odor                         | odorless                                          |
| c) Odor Threshold               | Not applicable                                    |
| d) pH                           | No data available                                 |
| e) Melting point/freezing point | Melting point/range: -153.8 °C (-244.8 °F) - lit. |

|    |                                              |                                                                     |
|----|----------------------------------------------|---------------------------------------------------------------------|
| f) | Initial boiling point and boiling range      | -13.4 °C 7.9 °F - lit.                                              |
| g) | Flash point                                  | -62 °C (-80 °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: 29.3 %(V)<br>Lower explosion limit: 3.8 %(V) |
| k) | Vapor pressure                               | No data available                                                   |
| l) | Vapor density                                | No data available                                                   |
| m) | Density                                      | 0.911 g/cm <sup>3</sup> at 25 °C (77 °F) - lit.                     |
|    | Relative density                             | No data available                                                   |
| n) | Water solubility                             | 9.15 g/l at 20 °C (68 °F)                                           |
| o) | Partition coefficient: n-octanol/water       | log Pow: 1.58 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                                                                |

## 9.2 Other safety information

No data available

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

### 10.3 Possibility of hazardous reactions

Violent reactions possible with:  
Strong oxidizing agents

### 10.4 Conditions to avoid

no information available

### 10.5 Incompatible materials

No data available



## 10.6 Hazardous decomposition products

In the event of fire: see section 5

---

## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

#### Acute toxicity

Oral: No data available

LC50 Inhalation - Rat - 2 h - 390 mg/l - gas

Remarks: (ECHA)

Dermal: 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

Test Type: In vitro mammalian cell gene mutation test

Test system: Chinese hamster lung cells

Metabolic activation: without metabolic activation

Result: negative

Remarks: (ECHA)

Test Type: Ames test

Test system: Salmonella typhimurium

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 471

Result: positive

Test Type: dominant lethal test

Species: Mouse

Application Route: inhalation (gas)

Result: negative

Remarks: (ECHA)

Test Type: Micronucleus test

Species: Mouse

Application Route: inhalation (gas)

Method: OECD Test Guideline 474

Result: positive

#### Carcinogenicity

May cause cancer. Positive evidence from human epidemiological studies.

IARC: 1 - Group 1: Carcinogenic to humans (Vinyl chloride)

NTP: Known - Known to be human carcinogen (Vinyl chloride)

OSHA: OSHA specifically regulated carcinogen (Vinyl chloride)

**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**

Repeated dose toxicity - Rat - male and female - Oral - 13 Weeks - NOAEL (No observed adverse effect level) - 30 mg/kg

RTECS: KU9625000

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting

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

Central nervous system -

---

**SECTION 12: Ecological information**

**12.1 Toxicity**

Toxicity to fish                      semi-static test LC50 - Danio rerio (zebra fish) - 210 mg/l - 96 h (OECD Test Guideline 203)

Toxicity to bacteria                Remarks: (ECHA)  
(Vinyl chloride)

**12.2 Persistence and degradability**

Biodegradability                  aerobic - Exposure time 28 d  
Result: 16 % - Not readily biodegradable.  
(OECD Test Guideline 301D)

**12.3 Bioaccumulative potential**

No data available

**12.4 Mobility in soil**

No data available

**12.5 Results of PBT and vPvB assessment**

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

**12.6 Endocrine disrupting properties**

No data available

**12.7 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. Pressurised gas bottle: dispose of only in empty condition! 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: 1086 Class: 2.1  
Proper shipping name: Vinyl chloride, stabilized  
Reportable Quantity (RQ): 1 lbs  
Reportable Quantity (RQ): 1 lbs  
Poison Inhalation Hazard: No

#### IMDG

UN number: 1086 Class: 2.1  
Proper shipping name: VINYL CHLORIDE, STABILIZED

EMS-No: F-D, S-U

#### IATA

UN number: 1086 Class: 2.1  
Proper shipping name: Vinyl chloride, stabilized  
IATA Passenger: Not permitted for transport

---

## 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 |
|----------------|---------|---------------|
| Vinyl chloride | 75-01-4 | 2007-07-01    |

#### SARA 311/312 Hazards

Fire Hazard, Sudden Release of Pressure Hazard, Acute Health Hazard, Chronic Health Hazard

Reportable Quantity : D043 lbs

### Massachusetts Right To Know Components

|                |                    |                             |
|----------------|--------------------|-----------------------------|
| Vinyl chloride | CAS-No.<br>75-01-4 | Revision Date<br>2007-07-01 |
| Phenol         | 108-95-2           | 2007-07-01                  |
| hydroquinone   | 123-31-9           | 2007-03-01                  |

### Pennsylvania Right To Know Components

|                |                    |                             |
|----------------|--------------------|-----------------------------|
| Vinyl chloride | CAS-No.<br>75-01-4 | Revision Date<br>2007-07-01 |
| Phenol         | 108-95-2           | 2007-07-01                  |

### California Prop. 65 Components

, which is/are known to the State of California to cause cancer. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov). Vinyl chloride

CAS-No.  
75-01-4  
Revision Date  
2007-09-28

---

## 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: 8.8

Revision Date: 08/23/2023

Print Date: 10/07/2023

## SAFETY DATA SHEET

Version 8.10  
Revision Date 08/17/2023  
Print Date 08/18/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Xylenes

Product Number : 534056  
Brand : SIGALD

**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 3), H226  
Acute toxicity, Inhalation (Category 4), H332  
Acute toxicity, Dermal (Category 4), H312  
Skin irritation (Category 2), H315  
Eye irritation (Category 2A), H319  
Carcinogenicity (Category 2), H351  
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335  
Specific target organ toxicity - repeated exposure (Category 2), hearing organs, H373  
Specific target organ toxicity - repeated exposure, Inhalation (Category 2), Central nervous system, Liver, Kidney, H373  
Aspiration hazard (Category 1), H304  
Short-term (acute) aquatic hazard (Category 2), H401

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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)

|             |                                                                                                                       |
|-------------|-----------------------------------------------------------------------------------------------------------------------|
| H226        | Flammable liquid and vapor.                                                                                           |
| H304        | May be fatal if swallowed and enters airways.                                                                         |
| H312 + H332 | Harmful in contact with skin or if inhaled.                                                                           |
| H315        | Causes skin irritation.                                                                                               |
| H319        | Causes serious eye irritation.                                                                                        |
| H335        | May cause respiratory irritation.                                                                                     |
| H351        | Suspected of causing cancer.                                                                                          |
| H373        | May cause damage to organs (hearing organs) through prolonged or repeated exposure.                                   |
| H373        | May cause damage to organs (Central nervous system, Liver, Kidney) through prolonged or repeated exposure if inhaled. |
| H401        | Toxic to aquatic life.                                                                                                |
| H412        | Harmful to aquatic life with long lasting effects.                                                                    |

Precautionary statement(s)

|                    |                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------|
| P201               | Obtain special instructions before use.                                                                                          |
| P202               | Do not handle until all safety precautions have been read and understood.                                                        |
| P210               | Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.                                                              |
| P233               | Keep container tightly closed.                                                                                                   |
| P240               | Ground/bond container and receiving equipment.                                                                                   |
| P241               | Use explosion-proof electrical/ ventilating/ lighting/ equipment.                                                                |
| P242               | Use only non-sparking tools.                                                                                                     |
| P243               | Take precautionary measures against static discharge.                                                                            |
| P260               | Do not breathe dust/ fume/ gas/ mist/ vapors/ spray.                                                                             |
| P264               | Wash skin thoroughly after handling.                                                                                             |
| P271               | Use only outdoors or in a well-ventilated area.                                                                                  |
| P273               | Avoid release to the environment.                                                                                                |
| P280               | Wear protective gloves/ protective clothing/ eye protection/ face protection.                                                    |
| P301 + P310        | IF SWALLOWED: Immediately call a POISON CENTER/ doctor.                                                                          |
| P303 + P361 + P353 | IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.                             |
| P304 + P340 + P312 | IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.      |
| P305 + P351 + P338 | IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. |
| P308 + P313        | IF exposed or concerned: Get medical advice/ attention.                                                                          |
| P331               | Do NOT induce vomiting.                                                                                                          |
| P332 + P313        | If skin irritation occurs: Get medical advice/ attention.                                                                        |
| P337 + P313        | If eye irritation persists: Get medical advice/ attention.                                                                       |

|             |                                                                                      |
|-------------|--------------------------------------------------------------------------------------|
| P362        | Take off contaminated clothing and wash before reuse.                                |
| P370 + P378 | In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish. |
| P403 + P233 | Store in a well-ventilated place. Keep container tightly closed.                     |
| P403 + P235 | Store in a well-ventilated place. Keep cool.                                         |
| P405        | Store locked up.                                                                     |
| P501        | Dispose of contents/ container to an approved waste disposal plant.                  |

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Synonyms : Xylene mixture of isomers

Formula :  $C_8H_{10}$

Molecular weight : 106.17 g/mol

| Component           | Classification                                                                                                                                                                              | Concentration      |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| <b>Xylene</b>       |                                                                                                                                                                                             |                    |
|                     | Flam. Liq. 3; Acute Tox. 4; Skin Irrit. 2; Eye Irrit. 2A; STOT SE 3; STOT RE 2; Asp. Tox. 1; Aquatic Acute 2; Aquatic Chronic 3; H226, H332, H312, H315, H319, H335, H373, H304, H401, H412 | $\geq 70 - < 90$ % |
| <b>ethylbenzene</b> |                                                                                                                                                                                             |                    |
|                     | Flam. Liq. 2; Acute Tox. 4; Carc. 2; STOT RE 2; Asp. Tox. 1; Aquatic Acute 2; Aquatic Chronic 3; H225, H332, H351, H373, H304, H401, H412                                                   | $\geq 20 - < 30$ % |

For the full text of the H-Statements mentioned in this Section, see Section 16.

## SECTION 4: First aid measures

### 4.1 Description of first-aid measures

#### General advice

Show this material safety data sheet to the doctor in attendance.

**If inhaled**

After inhalation: fresh air. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

**In case of skin contact**

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

**In case of eye contact**

After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

**If swallowed**

After swallowing: caution if victim vomits. Risk of aspiration! Keep airways free. Pulmonary failure possible after aspiration of vomit. Call a physician immediately.

**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**

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 at elevated temperatures.

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. Risk of explosion.

## **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 safe handling**

Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

#### **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**

Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition.

#### **Storage class**

Storage class (TRGS 510): 3: Flammable liquids

### **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                                                                                   |
|--------------|-----------|-------------------------------------------------------|----------------------|-----------------------------------------------------------------------------------------|
| Xylene       | 1330-20-7 | PEL                                                   | 100 ppm<br>435 mg/m3 | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|              |           | C                                                     | 300 ppm              | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|              |           | STEL                                                  | 150 ppm<br>655 mg/m3 | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|              |           | TWA                                                   | 100 ppm<br>435 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|              |           | TWA                                                   | 20 ppm               | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|              | Remarks   | Ototoxicant<br>Not classifiable as a human carcinogen |                      |                                                                                         |
| ethylbenzene | 100-41-4  | TWA                                                   | 100 ppm<br>435 mg/m3 | USA. NIOSH Recommended Exposure Limits                                                  |
|              |           | ST                                                    | 125 ppm<br>545 mg/m3 | USA. NIOSH Recommended Exposure Limits                                                  |
|              |           | TWA                                                   | 100 ppm<br>435 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|              |           | STEL                                                  | 30 ppm<br>130 mg/m3  | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|              |           | PEL                                                   | 5 ppm<br>22 mg/m3    | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |

#### Biological occupational exposure limits

| Component    | CAS-No.   | Parameters                                               | Value              | Biological specimen | Basis                                     |
|--------------|-----------|----------------------------------------------------------|--------------------|---------------------|-------------------------------------------|
| Xylene       | 1330-20-7 | Methylhippuric acids                                     | 1.5g/g creatinine  | Urine               | ACGIH - Biological Exposure Indices (BEI) |
|              | Remarks   | End of shift (As soon as possible after exposure ceases) |                    |                     |                                           |
| ethylbenzene | 100-41-4  | Sum of mandelic acid and phenyl glyoxylic acid           | 0.15g/g creatinine | Urine               | ACGIH - Biological Exposure Indices (BEI) |
|              |           | End of shift (As soon as possible after exposure ceases) |                    |                     |                                           |

## 8.2 Exposure controls

### Appropriate engineering controls

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: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 30 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the 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.

#### Respiratory protection

Recommended Filter type: Filter type ABEK

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer.

These measures have to be properly documented.

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. Risk of explosion.

---

## SECTION 9: Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

|                                                 |                                                                  |
|-------------------------------------------------|------------------------------------------------------------------|
| a) Appearance                                   | Form: clear, liquid<br>Color: colorless                          |
| b) Odor                                         | No data available                                                |
| c) Odor Threshold                               | No data available                                                |
| d) pH                                           | No data available                                                |
| e) Melting point/freezing point                 | < 0 °C (< 32 °F)                                                 |
| f) Initial boiling point and boiling range      | 136 - 140 °C 277 - 284 °F at 1,013 hPa                           |
| g) Flash point                                  | 25 °C (77 °F) - closed cup                                       |
| h) Evaporation rate                             | No data available                                                |
| i) Flammability (solid, gas)                    | No data available                                                |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 7 %(V)<br>Lower explosion limit: 1.1 %(V) |
| k) Vapor pressure                               | 24 hPa at 37.70 °C (99.86 °F)                                    |
| l) Vapor density                                | 3.67 - (Air = 1.0)                                               |
| m) Density                                      | 0.865 g/cm <sup>3</sup> at 20 °C (68 °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

|                        |                    |
|------------------------|--------------------|
| Relative vapor density | 3.67 - (Air = 1.0) |
|------------------------|--------------------|

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

Vapor/air-mixtures are explosive at intense warming.

### 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

Heating.

### 10.5 Incompatible materials

Strong oxidizing agents

### 10.6 Hazardous decomposition products

In the event of fire: see section 5

---

## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

#### Acute toxicity

Acute toxicity estimate Oral - 3,518 mg/kg  
(Calculation method)

LD50 Oral - Rat - male - 3,523 mg/kg (Xylene)  
(EC Directive 92/69/EEC B.1 Acute Toxicity (Oral))

Remarks: (ECHA)

Acute toxicity estimate Inhalation - 4 h - 12 mg/l - vapor (Calculation method)

LC50 Inhalation - Rat - male - 4 h - 29.09 mg/l - vapor  
(Xylene)

(Regulation (EC) No. 440/2008, Annex, B.2)  
Remarks: (Regulation (EC) No 1272/2008, Annex VI)

Acute toxicity estimate Dermal - 1,376 mg/kg  
(Calculation method)

LD50 Dermal - Rabbit - > 1,700 mg/kg (Xylene)

Remarks: (RTECS)

No data available

No data available

#### Skin corrosion/irritation

Skin - Rabbit (Xylene)

Result: Moderate skin irritation - 24 h

Remarks: (IUCLID)

Remarks: Drying-out effect resulting in rough and chapped skin.

After long-term exposure to the chemical:

Dermatitis

#### Serious eye damage/eye irritation

Eyes - Rabbit (Xylene)

Result: Causes serious eye irritation. - 24 h

Remarks: (RTECS)

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**Respiratory or skin sensitization**

Local lymph node assay (LLNA) - Mouse (Xylene)

Result: negative

(OECD Test Guideline 429)

**Germ cell mutagenicity**

Test Type: Mutagenicity (mammal cell test): chromosome aberration.  
(Xylene)

Test system: Chinese hamster ovary cells

Metabolic activation: with and without metabolic activation

Method: Regulation (EC) No. 440/2008, Annex, B.10

Result: negative

Remarks: (National Toxicology Program)

Test Type: Ames test

(Xylene)

Test system: Salmonella typhimurium

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 471

Result: negative

Test Type: sister chromatid exchange assay

(Xylene)

Test system: Chinese hamster ovary cells

Metabolic activation: with and without metabolic activation

Method: Regulation (EC) No. 440/2008, Annex, B.19

Result: negative

(Xylene)

Test Type: dominant lethal test

Species: Mouse

Method: OECD Test Guideline 478

Result: negative

**Carcinogenicity**

IARC: 2B - Group 2B: Possibly carcinogenic to humans (ethylbenzene)

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**

May be fatal if swallowed and enters airways.

## 11.2 Additional Information

Repeated dose toxicity - Rat - male and female - Oral - 90 d - NOAEL (No observed adverse effect level) - 150 mg/kg - LOAEL (Lowest observed adverse effect level) - 150 mg/kg

(Xylene)

Blurred vision, Incoordination., Headache, Nausea, Vomiting, Dizziness, Weakness, anemia, Prolonged or repeated exposure to skin causes defatting and dermatitis. (Xylene)

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated. (Xylene)

After absorption:

(Xylene)

Systemic effects:

(Xylene)

Headache

somnolence

Dizziness

agitation, spasms

narcosis

inebriation

(Xylene)

Effect potentiated by: ethanol

(Xylene)

Other dangerous properties can not be excluded.

(Xylene)

Handle in accordance with good industrial hygiene and safety practice.

(Xylene)

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

(Xylene)

---

## SECTION 12: Ecological information

### 12.1 Toxicity

No data available

Toxicity to fish                      static test LC50 - Oncorhynchus mykiss (rainbow trout) - 2.60 mg/l  
- 96 h (Xylene)  
(OECD Test Guideline 203)

Toxicity to algae                      static test EC50 - Pseudokirchneriella subcapitata - 4.36 mg/l - 73 h  
(Xylene)  
(OECD Test Guideline 201)

Toxicity to bacteria                      Remarks: (ECHA)  
(Xylene)

Toxicity to  
fish(Chronic toxicity)                      flow-through test NOEC - Oncorhynchus mykiss (rainbow trout) - >  
1.3 mg/l - 56 d (Xylene)  
Remarks: (ECHA)

Toxicity to daphnia                      NOEC - Ceriodaphnia dubia (water flea) - 0.96 mg/l - 7 d (Xylene)

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and other aquatic (US-EPA)  
invertebrates(Chronic  
toxicity)

#### **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 Endocrine disrupting properties**

No data available

#### **12.7 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: 1307    Class: 3    Packing group: III  
Proper shipping name: Xylenes  
Reportable Quantity (RQ): 125 lbs  
Reportable Quantity (RQ): 100 lbs  
Poison Inhalation Hazard: No

#### **IMDG**

UN number: 1307    Class: 3    Packing group: III    EMS-No: F-E, S-D  
Proper shipping name: XYLENES

#### **IATA**

UN number: 1307    Class: 3    Packing group: III  
Proper shipping name: Xylenes



---

## SECTION 15: Regulatory information

### US TSCA Section 3

This chemical/product is not and cannot be distributed in commerce (as defined in TSCA section 3(5)) or processed (as defined in TSCA section 3(13)) for consumer paint or coating removal.

### 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 |
|--------------|-----------|---------------|
| Xylene       | 1330-20-7 | 1993-04-24    |
| ethylbenzene | 100-41-4  | 2007-07-01    |

### SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Reportable Quantity : F003 lbs

### Massachusetts Right To Know Components

|              | CAS-No.   | Revision Date |
|--------------|-----------|---------------|
| Xylene       | 1330-20-7 | 1993-04-24    |
| ethylbenzene | 100-41-4  | 2007-07-01    |

### Pennsylvania Right To Know Components

|              | CAS-No.   | Revision Date |
|--------------|-----------|---------------|
| Xylene       | 1330-20-7 | 1993-04-24    |
| ethylbenzene | 100-41-4  | 2007-07-01    |

### California Prop. 65 Components

, which is/are known to the State of California to cause cancer. For more information go to [www.P65Warnings.ca.gov/ethylbenzene](http://www.P65Warnings.ca.gov/ethylbenzene)

| CAS-No.  | Revision Date |
|----------|---------------|
| 100-41-4 | 2007-09-28    |

### Other regulations

No data available

---

## 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: 8.10

Revision Date: 08/17/2023

Print Date: 08/18/2023

## SAFETY DATA SHEET

Version 6.13  
Revision Date 09/19/2023  
Print Date 10/07/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Zinc

Product Number : 209988  
Brand : Aldrich  
Index-No. : 030-001-01-9  
CAS-No. : 7440-66-6

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

Company : Sigma-Aldrich 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)**

Combustible dust,  
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

Warning

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**Hazard statement(s)**

H410

May form combustible dust concentrations in air.  
Very toxic to aquatic life with long lasting effects.

**Precautionary statement(s)**

P273

Avoid release to the environment.

P391

Collect spillage.

P501

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

**2.3 Hazards not otherwise classified (HNOC) or not covered by GHS**

Combustible dust

**SECTION 3: Composition/information on ingredients****3.1 Substances**

Formula : Zn  
Molecular weight : 65.39 g/mol  
CAS-No. : 7440-66-6  
EC-No. : 231-175-3  
Index-No. : 030-001-01-9

| Component                                | Classification                                                                                                 | Concentration |
|------------------------------------------|----------------------------------------------------------------------------------------------------------------|---------------|
| <b>zinc powder, zinc dust stabilized</b> |                                                                                                                |               |
|                                          | Aquatic Acute 1; Aquatic Chronic 1; H400, H410<br>M-Factor - Aquatic Acute: 1<br>M-Factor - Aquatic Chronic: 1 | <= 100 %      |
| <b>Zinc oxide</b>                        |                                                                                                                |               |
|                                          | Aquatic Acute 1; Aquatic Chronic 1; H400, H410<br>M-Factor - Aquatic Acute: 1<br>M-Factor - Aquatic Chronic: 1 | >= 1 - < 5 %  |

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**

No data available

**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

Aldrich - 209988

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**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**

Special powder against metal fire Sand Cement

**Unsuitable extinguishing media**

Water Foam

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

Zinc/zinc oxides

Combustible.

**5.3 Advice for firefighters**

No data available

**5.4 Further information**

No data available

---

**SECTION 6: Accidental release measures**

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

For personal protection see section 8.

**6.2 Environmental precautions**

No data available

**6.3 Methods and materials for containment and cleaning up**

No data available

**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**

Handle and store under inert gas. Air and moisture sensitive.

**Storage class**

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

| Component  | CAS-No.   | Value | Control parameters   | Basis                                                                                   |
|------------|-----------|-------|----------------------|-----------------------------------------------------------------------------------------|
| Zinc oxide | 1314-13-2 | TWA   | 2 mg/m <sup>3</sup>  | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|            |           | STEL  | 10 mg/m <sup>3</sup> | USA. ACGIH Threshold Limit Values (TLV)                                                 |
|            |           | TWA   | 5 mg/m <sup>3</sup>  | USA. NIOSH Recommended Exposure Limits                                                  |
|            |           | TWA   | 5 mg/m <sup>3</sup>  | USA. NIOSH Recommended Exposure Limits                                                  |
|            |           | ST    | 10 mg/m <sup>3</sup> | USA. NIOSH Recommended Exposure Limits                                                  |
|            |           | C     | 15 mg/m <sup>3</sup> | USA. NIOSH Recommended Exposure Limits                                                  |
|            |           | TWA   | 5 mg/m <sup>3</sup>  | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|            |           | TWA   | 15 mg/m <sup>3</sup> | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|            |           | TWA   | 5 mg/m <sup>3</sup>  | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants        |
|            |           | PEL   | 5 mg/m <sup>3</sup>  | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|            |           | STEL  | 10 mg/m <sup>3</sup> | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |

### 8.2 Exposure controls

#### Personal protective equipment

##### 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.

### **Control of environmental exposure**

Prevent product from entering drains.

---

## **SECTION 9: Physical and chemical properties**

### **9.1 Information on basic physical and chemical properties**

- |                                                 |                                                                          |
|-------------------------------------------------|--------------------------------------------------------------------------|
| a) Appearance                                   | Form: Dust<br>Color: dark gray                                           |
| b) Odor                                         | odorless                                                                 |
| c) Odor Threshold                               | Not applicable                                                           |
| d) pH                                           | Not applicable                                                           |
| e) Melting point/freezing point                 | Melting point/range: 420 °C (788 °F) - lit.                              |
| f) Initial boiling point and boiling range      | 907 °C 1665 °F - lit.                                                    |
| g) Flash point                                  | ( )Not applicable                                                        |
| h) Evaporation rate                             | No data available                                                        |
| i) Flammability (solid, gas)                    | May form combustible dust concentrations in air.                         |
| j) Upper/lower flammability or explosive limits | No data available                                                        |
| k) Vapor pressure                               | 1.33 hPa at 487 °C (909 °F)                                              |
| l) Vapor density                                | No data available                                                        |
| m) Density                                      | 7.133 g/cm <sup>3</sup> at 25 °C (77 °F) - lit.                          |
| Relative density                                | 6.922 °C                                                                 |
| n) Water solubility                             | 0.0001 g/l at 20 °C (68 °F) - OECD Test Guideline 105 - slightly soluble |
| o) Partition coefficient: n-octanol/water       | Not applicable for inorganic substances                                  |

- |                              |                   |
|------------------------------|-------------------|
| p) Autoignition temperature  | does not ignite   |
| q) Decomposition temperature | No data available |
| r) Viscosity                 | No data available |
| s) Explosive properties      | No data available |
| t) Oxidizing properties      | none              |

## 9.2 Other safety information

No data available

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

No data available

Contains the following stabilizer(s):

Zinc oxide ( $\leq 33\%$ )

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to avoid

No data available

### 10.5 Incompatible materials

Strong oxidizing agents, Acids and 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

Acute toxicity estimate Oral - 2,500 mg/kg

(Calculation method)

LD50 Oral - Rat - male and female -  $> 2,000$  mg/kg (zinc powder, zinc dust stabilized)  
(OECD Test Guideline 401)

Acute toxicity estimate Inhalation - 4 h - 5.41 mg/l - dust/mist (Calculation method)

LC50 Inhalation - Rat - male and female - 4 h -  $> 5.41$  mg/l - dust/mist  
(zinc powder, zinc dust stabilized)

(OECD Test Guideline 403)

Acute toxicity estimate Dermal -  $> 5,000$  mg/kg  
(Calculation method)

Dermal: No data available

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**Skin corrosion/irritation**

Skin - Rabbit (zinc powder, zinc dust stabilized)

Result: No skin irritation - 5 d

Remarks: (in analogy to similar products)  
(ECHA)

The value is given in analogy to the following substances: Zinc oxide

**Serious eye damage/eye irritation**

Eyes - Rabbit (zinc powder, zinc dust stabilized)

Result: No eye irritation - 24 h

(OECD Test Guideline 405)

**Respiratory or skin sensitization**

Maximization Test - Guinea pig (zinc powder, zinc dust stabilized)

Result: negative

(OECD Test Guideline 406)

Remarks: (in analogy to similar products)

The value is given in analogy to the following substances: Zinc oxide

**Germ cell mutagenicity**

Test Type: Ames test

(zinc powder, zinc dust stabilized)

Test system: Escherichia coli/Salmonella typhimurium

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 471

Result: negative

Remarks: (in analogy to similar products)

The value is given in analogy to the following substances: Zinc sulphate  
Test Type: In vitro mammalian cell gene mutation test

(zinc powder, zinc dust stabilized)

Test system: mouse lymphoma cells

Metabolic activation: without metabolic activation

Result: negative

Remarks: (in analogy to similar products)

(ECHA)

The value is given in analogy to the following substances: zinc chloride  
Test Type:

Chromosome aberration test in vitro

(zinc powder, zinc dust stabilized)

Test system: Other cell types

Metabolic activation: with and without metabolic activation

Result: negative

Remarks: (in analogy to similar products)

(ECHA)

The value is given in analogy to the following substances: zinc chloride (zinc powder, zinc dust stabilized)

Test Type: Micronucleus test

Species: Mouse

Cell type: Red blood cells (erythrocytes)

Application Route: Intraperitoneal

Result: negative

Remarks: (in analogy to similar products)

(ECHA)

The value is given in analogy to the following substances: Zinc sulphate

## **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

## **11.2 Additional Information**

Repeated dose toxicity - Rat - male and female - Oral - 13 Weeks - NOAEL (No observed adverse effect level) - 31.52 mg/kg - LOAEL (Lowest observed adverse effect level) - 53.8 mg/kg

(zinc powder, zinc dust stabilized)

RTECS: ZG8600000

Effects due to ingestion may include: chills, dry throat, sweet taste, Fever, Cough, Nausea, Vomiting, Weakness, Contact with eyes or skin may cause: Irritation (zinc powder, zinc dust stabilized)

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated. (zinc powder, zinc dust stabilized)

---

## **SECTION 12: Ecological information**

### **12.1 Toxicity**

|                                                     |                                                                                                                                                     |
|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Toxicity to fish                                    | flow-through test LC50 - other fish - 0.439 mg/l - 96 h (zinc powder, zinc dust stabilized)<br>Remarks: (ECHA)                                      |
| Toxicity to daphnia and other aquatic invertebrates | static test EC50 - Ceriodaphnia dubia (water flea) - 0.155 mg/l - 48 h (zinc powder, zinc dust stabilized)<br>(US-EPA)                              |
| Toxicity to algae                                   | static test NOEC - Pseudokirchneriella subcapitata (green algae) - 0.05 mg/l - 3 d (zinc powder, zinc dust stabilized)<br>(OECD Test Guideline 201) |
| Toxicity to bacteria                                | static test NOEC - activated sludge - 0.1 mg/l - 4 h (zinc powder, zinc dust stabilized)<br>(ISO 9509)<br>Remarks: (in analogy to similar products) |

Toxicity to fish(Chronic toxicity) flow-through test NOEC - other fish - 0.169 mg/l - 30 d (zinc powder, zinc dust stabilized)  
Remarks: (ECHA)

Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity) semi-static test NOEC - Daphnia magna (Water flea) - 0.100 mg/l - 3 Weeks (zinc powder, zinc dust stabilized)  
Remarks: (ECHA)

#### **12.2 Persistence and degradability**

The methods for determining the biological degradability are not applicable to inorganic substances.

#### **12.3 Bioaccumulative potential**

This substance is not considered to be persistent, bioaccumulating and toxic (PBT).

#### **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 Endocrine disrupting properties**

No data available

#### **12.7 Other adverse effects**

No data available

---

### **SECTION 13: Disposal considerations**

#### **13.1 Waste treatment methods**

No data available

---

### **SECTION 14: Transport information**

#### **DOT (US)**

UN number: 3077 Class: 9 Packing group: III  
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (zinc powder, zinc dust stabilized, Zinc oxide)  
Reportable Quantity (RQ): 1030 lbs  
Poison Inhalation Hazard: No

#### **IMDG**

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F  
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (zinc powder, zinc dust stabilized, Zinc oxide)

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Marine pollutant : yes

Marine pollutant : no

**IATA**

UN number: 3077 Class: 9

Packing group: III

Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (zinc powder, zinc dust stabilized, Zinc oxide)

**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

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 |
|-----------------------------------|-----------|---------------|
| zinc powder, zinc dust stabilized | 7440-66-6 | 1993-02-16    |
|                                   | 1314-13-2 | 2007-03-01    |
| Zinc oxide                        |           |               |

### SARA 311/312 Hazards

No SARA Hazards

### Massachusetts Right To Know Components

|                                   | CAS-No.   | Revision Date |
|-----------------------------------|-----------|---------------|
| zinc powder, zinc dust stabilized | 7440-66-6 | 1993-02-16    |
|                                   | 1314-13-2 | 2007-03-01    |
| Zinc oxide                        |           |               |

### Pennsylvania Right To Know Components

|                                   | CAS-No.   | Revision Date |
|-----------------------------------|-----------|---------------|
| zinc powder, zinc dust stabilized | 7440-66-6 | 1993-02-16    |
|                                   | 1314-13-2 | 2007-03-01    |
| Zinc oxide                        |           |               |

---

## SECTION 16: Other information

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Version: 6.13

Revision Date: 09/19/2023

Print Date: 10/07/2023

## Appendix D

### Certifications

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# Individual User Report

## Training Summary

### Dominic Grasso

Report Date : October 27,2023

Name: Dominic Grasso

| Completed                                                       |            |            |
|-----------------------------------------------------------------|------------|------------|
| Title                                                           | Completed  | Expiry     |
| 2022 Quarter 2 Quarterly Field Services Notes [Anchor QEA, LLC] | 25/04/2022 | -          |
| 2022 Quarter 3 Quarterly Field Services Notes [Anchor QEA, LLC] | 02/08/2022 | -          |
| 2022 Quarter 4 Quarterly Field Services Notes [Anchor QEA, LLC] | 10/10/2022 | -          |
| 2023 Driving Safety: The Basics [MARCOM_BIZ Library]            | 14/03/2023 | 14/03/2024 |
| 2023 Fire Extinguisher Training [Anchor QEA, LLC]               | 14/03/2023 | 14/03/2024 |
| Adult & Pediatric First Aid/CPR/AED [American Red Cross]        | 27/03/2023 | 27/03/2025 |
| Bloodborne Pathogens Course [American Red Cross]                | 27/03/2023 | 27/03/2024 |
| Bloodborne Pathogens Course [ProTrainings]                      | 22/03/2023 | 22/03/2024 |
| HAZWOPER 40 Hour Training [Safety Unlimited, Inc.]              | 20/04/2021 | -          |
| HAZWOPER 8 Hour Refresher 2023 In-Person [Anchor QEA, LLC]      | 13/02/2023 | 13/02/2024 |
| Inorganic Arsenic Hazard Awareness [Anchor QEA, LLC]            | 24/10/2023 | 24/10/2024 |
|                                                                 |            |            |

|                                                                 |            |            |
|-----------------------------------------------------------------|------------|------------|
| Lead Exposure [BIZ Library]                                     | 24/10/2023 | 24/10/2024 |
| Medical Surveillance Exam [Occupational Health Monitoring]      | 19/04/2023 | 19/04/2024 |
| Mercury & Heavy Metals Testing [Occupational Health Monitoring] | 18/05/2023 | -          |
| Mercury Safety [Anchor QEA, LLC]                                | 24/10/2023 | 24/10/2024 |
| Vaccination HEP A (1st) [Occupational Health Monitoring]        | 22/02/2017 | -          |
| Vaccination HEP A (2nd) [Occupational Health Monitoring]        | 07/05/2021 | -          |
| Vaccination HEP B (1st) [Occupational Health Monitoring]        | 06/08/1998 | -          |
| Vaccination HEP B (2nd) [Occupational Health Monitoring]        | 02/10/1998 | -          |
| Vaccination HEP B (3rd) [Occupational Health Monitoring]        | 05/11/1999 | -          |
| Vaccination TDAP [Occupational Health Monitoring]               | 07/05/2021 | -          |
| Vaccination Tetanus [Occupational Health Monitoring]            | 07/05/2021 | 07/05/2031 |
| Emergency Response Plan Annual Review - Syracuse                | 14/03/2023 | 14/03/2024 |



# Individual User Report

## Training Summary

### Emma Mauro

Report Date : November 30,2023

Name: Emma Mauro

| Completed                                                          |            |            |
|--------------------------------------------------------------------|------------|------------|
| Title                                                              | Completed  | Expiry     |
| 2023 Driving Safety: The Basics [MARCOM_BIZ Library]               | 03/08/2023 | 03/08/2024 |
| 2023 Fire Extinguisher Training [Anchor QEA, LLC]                  | 03/08/2023 | 03/08/2024 |
| Adult First Aid/CPR/AED [ProTrainings]                             | 07/08/2023 | 07/08/2025 |
| Bloodborne Pathogens Course [ProTrainings]                         | 03/08/2023 | 03/08/2024 |
| HAZWOPER 40 Hour Training [Safety Unlimited, Inc.]                 | 23/05/2022 | -          |
| HAZWOPER 8 Hour Refresher 2023 Online [Anchor QEA, LLC]            | 04/08/2023 | 04/08/2024 |
| HAZWOPER 8 Hour Refresher 2023 Online Completion [Anchor QEA, LLC] | 11/08/2023 | 11/08/2024 |
| Inorganic Arsenic Hazard Awareness [Anchor QEA, LLC]               | 30/10/2023 | 30/10/2024 |
| Lead Exposure [BIZ Library]                                        | 30/10/2023 | 30/10/2024 |
| Medical Surveillance Exam [Occupational Health Monitoring]         | 09/08/2023 | 09/08/2024 |
| Mercury & Heavy Metals Testing [Occupational Health Monitoring]    | 08/08/2023 | -          |
|                                                                    |            |            |



|                                                          |            |            |
|----------------------------------------------------------|------------|------------|
| Mercury Safety [Anchor QEA, LLC]                         | 30/10/2023 | 30/10/2024 |
| Emergency Response Plan Annual Review - Saratoga Springs | 03/08/2023 | 03/08/2024 |
| Emergency Response Plan Annual Review - Amesbury         | 03/08/2023 | 03/08/2024 |



# Individual User Report

## Training Summary

### James Ryan

Report Date : October 27,2023

Name: James Ryan

| Completed                                                              |            |            |
|------------------------------------------------------------------------|------------|------------|
| Title                                                                  | Completed  | Expiry     |
| 10 Hour Construction [Saratoga Safety, Inc.]                           | 15/04/2008 | -          |
| 2022 Driving Safety: The Basics [MARCOM_BIZ Library]                   | 13/12/2022 | 13/12/2023 |
| 2022 Using Fire Extinguishers Effectively [BIZ Library]                | 16/11/2022 | 16/11/2023 |
| Adult & Pediatric First Aid/CPR/AED [American Red Cross]               | 27/03/2023 | 27/03/2025 |
| Amtrak Right of Entry Permit/RR Contr. Safety Trng [Amtrak Contractor] | 14/08/2018 | -          |
| Bloodborne Pathogens Course [American Red Cross]                       | 27/03/2023 | 27/03/2024 |
| Distracted Driving Course [Smith System]                               | 26/01/2018 | -          |
| Distracted Driving Course [Smith System]                               | 23/09/2014 | -          |
| DOT Medical Exam Certification 2 [Occupational Health Monitoring]      | 29/03/2022 | 29/03/2024 |
| DOT Medical Exam Certification 2 [Occupational Health Monitoring]      | 01/04/2022 | 01/04/2024 |
| Fire Extinguisher/Hot work [Saratoga Safety, Inc.]                     | 24/06/2003 | -          |
|                                                                        |            |            |

|                                                                            |            |            |
|----------------------------------------------------------------------------|------------|------------|
| Hazard Communication Training [Anchor QEA, LLC]                            | 03/01/2014 | -          |
| HAZWOPER 40 Hour Training [Compliance Solutions]                           | 19/08/2002 | -          |
| HAZWOPER 8 Hour Refresher 2023 In-Person [Anchor QEA, LLC]                 | 15/02/2023 | 15/02/2024 |
| HAZWOPER Supervisor 8 Hour Initial [Saratoga Safety, Inc.]                 | 22/06/2006 | -          |
| Historical DOT Medical Exam Certification [Occupational Health Monitoring] | 09/01/2018 | -          |
| Historical DOT Medical Exam Certification [Occupational Health Monitoring] | 22/01/2020 | -          |
| Historical DOT Medical Exam Certification [Occupational Health Monitoring] | 21/01/2014 | -          |
| Historical DOT Medical Exam Certification [Occupational Health Monitoring] | 29/01/2016 | -          |
| Medical Authorization Release Letter [Occupational Health Monitoring]      | 03/08/2017 | -          |
| Medical Surveillance Exam [Occupational Health Monitoring]                 | 04/05/2023 | 04/05/2024 |
| Mercury & Heavy Metals Testing [Occupational Health Monitoring]            | 04/05/2023 | -          |
| National Grid Contractor Badge [National Grid]                             | 24/08/2017 | -          |
| Vaccination HEP A (1st) [Occupational Health Monitoring]                   | 23/02/2012 | -          |
| Vaccination HEP A (2nd) [Occupational Health Monitoring]                   | 23/08/2012 | -          |
| Vaccination HEP B (1st) [Occupational Health Monitoring]                   | 08/02/2012 | -          |
| Vaccination HEP B (2nd) [Occupational Health Monitoring]                   | 15/03/2012 | -          |
| Vaccination HEP B (3rd) [Occupational Health Monitoring]                   | 23/08/2012 | -          |



# Individual User Report

## Training Summary

### Matthew Cavas

Report Date : October 27,2023

Name: Matthew Cavas

| Completed                                                            |            |            |
|----------------------------------------------------------------------|------------|------------|
| Title                                                                | Completed  | Expiry     |
| 10 Hour Construction [Saratoga Safety, Inc.]                         | 15/04/2008 | -          |
| 2023 Driving Safety: The Basics [MARCOM_BIZ Library]                 | 27/09/2023 | 27/09/2024 |
| 2023 Fire Extinguisher Training [Anchor QEA, LLC]                    | 27/09/2023 | 27/09/2024 |
| Adult & Pediatric First Aid/CPR/AED [American Red Cross]             | 07/12/2022 | 07/12/2024 |
| All About Non-Permit Confined Spaces [BIZ Library]                   | 24/04/2023 | 24/04/2024 |
| BC 4x4 General Field Health and Safety Training [Brown and Caldwell] | 17/03/2006 | -          |
| Bloodborne Pathogens Course [American Red Cross]                     | 07/12/2022 | 07/12/2023 |
| Distracted Driving Course [Smith System]                             | 14/05/2015 | -          |
| Distracted Driving Course [Smith System]                             | 27/02/2018 | -          |
| DOT HAZWOPER Awareness Level [Saratoga Safety, Inc.]                 | 11/11/2008 | -          |
| DOT Medical Exam Certification 2 [Occupational Health Monitoring]    | 18/05/2022 | 18/05/2024 |
|                                                                      |            |            |

|                                                                            |            |            |
|----------------------------------------------------------------------------|------------|------------|
| Duke Energy Environmental Handbook [PowerSafe]                             | 31/01/2018 | -          |
| Hazard Communication Training [Anchor QEA, LLC]                            | 21/11/2013 | -          |
| HAZWOPER 40 Hour Training [Emilcott Associates, Inc.]                      | 12/04/2004 | -          |
| HAZWOPER 8 Hour Refresher 2023 In-Person [Anchor QEA, LLC]                 | 16/03/2023 | 16/03/2024 |
| HAZWOPER Supervisor 8 Hour Initial [Brown and Caldwell]                    | 20/04/2004 | -          |
| Historical DOT Medical Exam Certification [Occupational Health Monitoring] | 29/08/2019 | -          |
| Historical DOT Medical Exam Certification [Occupational Health Monitoring] | 31/08/2017 | -          |
| Medical Authorization Release Letter [Occupational Health Monitoring]      | 27/06/2017 | -          |
| Medical Surveillance Exam [Occupational Health Monitoring]                 | 02/05/2023 | 02/05/2024 |
| Medical Surveillance Exit Exam [Occupational Health Monitoring]            | 04/06/2021 | -          |
| Mercury & Heavy Metals Testing [Occupational Health Monitoring]            | 02/05/2023 | -          |
| RCRA Waste Handler [Saratoga Safety, Inc.]                                 | 11/11/2008 | -          |
| Vaccination DIPHTHERIA [Occupational Health Monitoring]                    | 28/08/2011 | -          |
| Vaccination HEP A/B Twinrex 1st [Occupational Health Monitoring]           | 27/03/2012 | -          |
| Vaccination HEP A/B Twinrex 2nd [Occupational Health Monitoring]           | 30/05/2012 | -          |
| Vaccination HEP A/B Twinrex 3rd [Occupational Health Monitoring]           | 29/11/2012 | -          |
| Workspace - Identify Safety Items                                          | 30/09/2022 | -          |
| Workspace - Identify Safety Items                                          | 24/04/2023 | -          |
| Workspace - Identify Safety Items                                          | 24/04/2023 | -          |
| Fieldwork Support Questionnaire                                            | 30/09/2022 | -          |
| Emergency Response Plan Annual Review - Saratoga Springs                   | 31/05/2023 | 31/05/2024 |



# Individual User Report

## Training Summary

### Natalie Lynch

Report Date : November 30,2023

Name: Natalie Lynch

| Completed                                                   |            |            |
|-------------------------------------------------------------|------------|------------|
| Title                                                       | Completed  | Expiry     |
| 2023 Driving Safety: The Basics [MARCOM_BIZ Library]        | 06/02/2023 | 06/02/2024 |
| 2023 Fire Extinguisher Training [Anchor QEA, LLC]           | 06/01/2023 | 06/01/2024 |
| Adult First Aid/CPR/AED [American Red Cross]                | 19/07/2022 | 19/07/2024 |
| All About Non-Permit Confined Spaces [BIZ Library]          | 17/07/2023 | 17/07/2024 |
| Bloodborne Pathogens Course [ProTrainings]                  | 12/07/2023 | 12/07/2024 |
| HAZWOPER 40 Hour Training [USF OTI Education Center]        | 19/04/2022 | -          |
| HAZWOPER 8 Hour Refresher 2023 In-Person [Anchor QEA, LLC]  | 20/02/2023 | 20/02/2024 |
| HAZWOPER Supervisor 8 Hour Initial [Safety Unlimited, Inc.] | 14/07/2023 | -          |
| Inorganic Arsenic Hazard Awareness [Anchor QEA, LLC]        | 22/11/2023 | 22/11/2024 |
| Lead Exposure [BIZ Library]                                 | 22/11/2023 | 22/11/2024 |
| Medical Surveillance Exam [Occupational Health Monitoring]  | 20/04/2023 | 20/04/2024 |
|                                                             |            |            |

|                                                                                    |            |            |
|------------------------------------------------------------------------------------|------------|------------|
| Mercury & Heavy Metals Testing [Occupational Health Monitoring]                    | 25/04/2023 | -          |
| Mercury Safety [Anchor QEA, LLC]                                                   | 22/11/2023 | 22/11/2024 |
| Vaccination DIPHTHERIA [Occupational Health Monitoring]                            | 20/04/2023 | -          |
| Vaccination HEP A (1st) [Occupational Health Monitoring]                           | 03/07/2023 | -          |
| Vaccination Hep B Titer - check immunity to Hep B [Occupational Health Monitoring] | 20/04/2023 | -          |
| Vaccination Tetanus [Occupational Health Monitoring]                               | 20/04/2023 | 20/04/2033 |
| Workspace - Identify Safety Items                                                  | 19/09/2022 | -          |
| Fieldwork Support Questionnaire                                                    | 19/09/2022 | -          |
| Emergency Response Plan Annual Review - Woodcliff Lake                             | 28/09/2023 | 28/09/2024 |



# Individual User Report

## Training Summary

### Scott Sanders

Report Date : November 30,2023

Name: Scott Sanders

| Completed                                                                      |            |            |
|--------------------------------------------------------------------------------|------------|------------|
| Title                                                                          | Completed  | Expiry     |
| 2023 Driving Safety: The Basics [MARCOM_BIZ Library]                           | 01/05/2023 | 01/05/2024 |
| 2023 Fire Extinguisher Training [Anchor QEA, LLC]                              | 30/04/2023 | 30/04/2024 |
| Adult First Aid/CPR/AED [ProTrainings]                                         | 15/05/2023 | 15/05/2025 |
| Annual Respirator Clearance and Fit Test Exam [Occupational Health Monitoring] | 31/05/2023 | 31/05/2024 |
| Bloodborne Pathogens Course [ProTrainings]                                     | 07/05/2023 | 07/05/2024 |
| HAZWOPER 40 Hour Training [Condor Geotechnical Services, Inc.]                 | 15/06/2000 | -          |
| HAZWOPER 8 Hour Refresher 2023 Online [Anchor QEA, LLC]                        | 16/05/2023 | 16/05/2024 |
| HAZWOPER 8 Hour Refresher 2023 Online Completion [Anchor QEA, LLC]             | 16/05/2023 | 16/05/2024 |
| Inorganic Arsenic Hazard Awareness [Anchor QEA, LLC]                           | 18/08/2023 | 18/08/2024 |
| Lead Exposure [BIZ Library]                                                    | 18/08/2023 | 18/08/2024 |
| Medical Surveillance Exam [Occupational Health Monitoring]                     | 31/05/2023 | 31/05/2024 |



|                                                                 |            |            |
|-----------------------------------------------------------------|------------|------------|
| Mercury & Heavy Metals Testing [Occupational Health Monitoring] | 31/05/2023 | -          |
| Mercury Safety [Anchor QEA, LLC]                                | 18/08/2023 | 18/08/2024 |
| OSHA Respiratory Protection [Safety Provisions]                 | 14/10/2023 | 14/10/2024 |
| Emergency Response Plan Annual Review - Saratoga Springs        | 16/05/2023 | 16/05/2024 |



# Individual User Report

## Training Summary

### Stephen Colquhoun

Report Date : October 29,2023

**Name:** Stephen Colquhoun

| Completed                                                                      |            |            |
|--------------------------------------------------------------------------------|------------|------------|
| Title                                                                          | Completed  | Expiry     |
| 2-HR Confined Space Entry Refresher [eTraining, Inc.]                          | 18/01/2023 | 18/01/2024 |
| 2022 Quarter 3 Quarterly Field Services Notes [Anchor QEA, LLC]                | 28/07/2022 | -          |
| 2022 Quarter 4 Quarterly Field Services Notes [Anchor QEA, LLC]                | 12/10/2022 | -          |
| 2023 Driving Safety: The Basics [MARCOM_BIZ Library]                           | 11/09/2023 | 11/09/2024 |
| 2023 Fire Extinguisher Training [Anchor QEA, LLC]                              | 11/09/2023 | 11/09/2024 |
| Adult First Aid/CPR/AED [ProTrainings]                                         | 12/10/2023 | 12/10/2025 |
| Annual Respirator Clearance and Fit Test Exam [Occupational Health Monitoring] | 13/01/2023 | 13/01/2024 |
| Bloodborne Pathogens Course [ProTrainings]                                     | 11/09/2023 | 11/09/2024 |
| Covid-19 Training North Carolina [NC Dept of Health and Human Services]        | 25/01/2021 | -          |
| Duke Dropped Object Prevention (12DKDOP) [PowerSafe]                           | 30/11/2020 | -          |
| Duke General FHO Orientation (12DKFHO) [PowerSafe]                             | 30/11/2020 | -          |

|                                                                 |            |            |
|-----------------------------------------------------------------|------------|------------|
| Duke Haz Loc & Intrinsically Safe Equip(12DKHLIS) [PowerSafe]   | 30/11/2020 | -          |
| Duke Human Performance (12DKHP) [PowerSafe]                     | 30/11/2020 | -          |
| Duke Lockout/Tagout (12DKLTO) [PowerSafe]                       | 30/11/2020 | -          |
| Duke PowerSafe Generation (12PSGEN) [PowerSafe]                 | 30/11/2020 | -          |
| Duke PSM/RMP Orientation (12DKPSM) [PowerSafe]                  | 30/11/2020 | -          |
| Duke Spotter/Observer Orientation (12DKSPOB) [PowerSafe]        | 30/11/2020 | -          |
| Energy Control Initial [Anchor QEA, LLC]                        | 11/08/2022 | -          |
| HAZWOPER 40 Hour Training [Safety Unlimited, Inc.]              | 28/06/2019 | -          |
| HAZWOPER 8 Hour Refresher 2023 In-Person [Anchor QEA, LLC]      | 17/02/2023 | 17/02/2024 |
| HAZWOPER Supervisor 8 Hour Initial [Safety Unlimited, Inc.]     | 24/01/2022 | -          |
| Inorganic Arsenic Hazard Awareness [Anchor QEA, LLC]            | 28/10/2023 | 28/10/2024 |
| Lead Exposure [BIZ Library]                                     | 28/10/2023 | 28/10/2024 |
| Medical Surveillance Exam [Occupational Health Monitoring]      | 20/06/2023 | 20/06/2024 |
| Mercury & Heavy Metals Testing [Occupational Health Monitoring] | 28/04/2023 | -          |
| Mercury Safety [Anchor QEA, LLC]                                | 28/10/2023 | 28/10/2024 |
| OSHA Respiratory Protection [Safety Provisions]                 | 12/01/2023 | 12/01/2024 |
| Vaccination HEP A (1st) [Occupational Health Monitoring]        | 28/06/2019 | -          |
| Vaccination HEP A (2nd) [Occupational Health Monitoring]        | 27/01/2021 | -          |
| Vaccination HEP B (1st) [Occupational Health Monitoring]        | 23/03/1995 | -          |
| Vaccination HEP B (2nd) [Occupational Health Monitoring]        | 30/05/1995 | -          |
| Vaccination HEP B (3rd) [Occupational Health Monitoring]        | 17/08/1995 | -          |
| Vaccination HEP B (3rd) [Occupational Health Monitoring]        | 28/06/2019 | -          |
| Vaccination TDAP [Occupational Health Monitoring]               | 12/09/2023 | -          |
|                                                                 |            |            |

|                                   |            |   |
|-----------------------------------|------------|---|
| Workspace - Identify Safety Items | 19/09/2022 | - |
| Fieldwork Support Questionnaire   | 19/09/2022 | - |



# Individual User Report

## Training Summary

### Stephen Messur

Report Date : November 30,2023

**Name:** Stephen Messur

| Completed                                                                      |            |            |
|--------------------------------------------------------------------------------|------------|------------|
| Title                                                                          | Completed  | Expiry     |
| 10 Hour Construction [AdvanceOnline Solutions]                                 | 25/07/2019 | -          |
| 2023 Driving Safety: The Basics [MARCOM_BIZ Library]                           | 21/03/2023 | 21/03/2024 |
| 2023 Fire Extinguisher Training [Anchor QEA, LLC]                              | 21/03/2023 | 21/03/2024 |
| Adult First Aid/CPR/AED [ProTrainings]                                         | 21/03/2023 | 21/03/2025 |
| All About Non-Permit Confined Spaces [BIZ Library]                             | 19/09/2023 | 19/09/2024 |
| Annual Respirator Clearance and Fit Test Exam [Occupational Health Monitoring] | 05/04/2023 | 05/04/2024 |
| Bloodborne Pathogens Course [ProTrainings]                                     | 02/12/2022 | 02/12/2023 |
| DOT/IATA Hazardous Materials Shipping/Transport [ARCADIS]                      | 12/03/2022 | -          |
| HAZWOPER 40 Hour Training [Safety Unlimited, Inc.]                             | 15/06/2015 | -          |
| HAZWOPER 8 Hour Refresher 2023 In-Person [Anchor QEA, LLC]                     | 21/02/2023 | 21/02/2024 |
| HAZWOPER Supervisor 8 Hour Initial [Safety Unlimited, Inc.]                    | 30/03/2023 | -          |

|                                                                                                 |            |            |
|-------------------------------------------------------------------------------------------------|------------|------------|
| Medical Surveillance Exam [Occupational Health Monitoring]                                      | 05/04/2023 | 05/04/2024 |
| Mercury & Heavy Metals Testing [Occupational Health Monitoring]                                 | 05/04/2023 | -          |
| OSHA Respiratory Protection [Safety Provisions]                                                 | 21/03/2023 | 21/03/2024 |
| Transportation Worker Identification Credential - 5 YR [Transportation Security Administration] | 05/01/2020 | 05/01/2025 |
| Vaccination HEP A (1st) [Occupational Health Monitoring]                                        | 08/08/2023 | -          |
| Vaccination HEP B (1st) [Occupational Health Monitoring]                                        | 31/07/2023 | -          |
| Vaccination TDAP [Occupational Health Monitoring]                                               | 31/07/2023 | -          |
| Emergency Response Plan Annual Review - Horsham                                                 | 21/03/2023 | 21/03/2024 |



# Individual User Report

## Training Summary

### Zachary Burcham

Report Date : November 03,2023

**Name:** Zachary Burcham

| Completed                                                       |            |            |
|-----------------------------------------------------------------|------------|------------|
| Title                                                           | Completed  | Expiry     |
| 2022 Quarter 2 Quarterly Field Services Notes [Anchor QEA, LLC] | 25/04/2022 | -          |
| 2022 Quarter 3 Quarterly Field Services Notes [Anchor QEA, LLC] | 02/08/2022 | -          |
| 2022 Quarter 4 Quarterly Field Services Notes [Anchor QEA, LLC] | 12/10/2022 | -          |
| 2023 Driving Safety: The Basics [MARCOM_BIZ Library]            | 10/08/2023 | 10/08/2024 |
| 2023 Fire Extinguisher Training [Anchor QEA, LLC]               | 10/08/2023 | 10/08/2024 |
| Adult First Aid/CPR/AED [American Red Cross]                    | 14/08/2023 | 14/08/2025 |
| Bloodborne Pathogens Course [ProTrainings]                      | 10/08/2023 | 10/08/2024 |
| HAZWOPER 40 Hour Training [Safety Unlimited, Inc.]              | 12/07/2021 | -          |
| HAZWOPER 8 Hour Refresher 2023 In-Person [Anchor QEA, LLC]      | 21/02/2023 | 21/02/2024 |
| Inorganic Arsenic Hazard Awareness [Anchor QEA, LLC]            | 30/10/2023 | 30/10/2024 |
| Lead Exposure [BIZ Library]                                     | 30/10/2023 | 30/10/2024 |
|                                                                 |            |            |

|                                                                 |            |            |
|-----------------------------------------------------------------|------------|------------|
| Medical Surveillance Exam [Occupational Health Monitoring]      | 02/10/2023 | 02/10/2024 |
| Mercury & Heavy Metals Testing [Occupational Health Monitoring] | 07/08/2023 | -          |
| Mercury Safety [Anchor QEA, LLC]                                | 30/10/2023 | 30/10/2024 |
| Vaccination HEP A (1st) [Occupational Health Monitoring]        | 05/08/2010 | -          |
| Vaccination HEP A (2nd) [Occupational Health Monitoring]        | 05/11/2012 | -          |
| Vaccination HEP B (1st) [Occupational Health Monitoring]        | 26/09/1998 | -          |
| Vaccination HEP B (2nd) [Occupational Health Monitoring]        | 29/04/1999 | -          |
| Vaccination HEP B (3rd) [Occupational Health Monitoring]        | 29/10/2014 | -          |
| Vaccination TDAP [Occupational Health Monitoring]               | 29/06/2023 | -          |
| Workspace - Identify Safety Items                               | 22/09/2022 | -          |
| Fieldwork Support Questionnaire                                 | 22/09/2022 | -          |
| Emergency Response Plan Annual Review - Horsham                 | 10/08/2023 | 10/08/2024 |



## Appendix E

### Pandemic and Epidemic Safety Plan

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November 2022



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# Pandemic and Epidemic Safety Plan



November 2022

# Pandemic and Epidemic Safety Plan

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## ABBREVIATIONS

|      |                                                 |
|------|-------------------------------------------------|
| CDC  | U.S. Centers for Disease Control and Prevention |
| EPA  | U.S. Environmental Protection Agency            |
| H&S  | Health and Safety                               |
| OSHA | Occupational Safety and Health Administration   |
| PPE  | personal protective equipment                   |

# 1 Introduction and Background

Anchor QEA, LLC, and all subsidiaries (Anchor QEA) has developed this Pandemic and Epidemic Safety Plan, which applies to both office and field work. The objective of this Safety Plan is to provide operational guidelines that address the challenges presented by a pandemic or epidemic and ensure consistency in Anchor QEA's response actions across the firm. We have developed this Safety Plan to support operational efforts. There are a lot of issues to consider, but the underlying priority is protecting employees, coworkers, and families. This plan will be applied pre- and post-pandemic in addition to during a designated pandemic or epidemic at the discretion of the Health and Safety (H&S) Program Lead, Director of Health and Safety, Chief Executive Officer, and/or Managing Committee. This plan may require periodic updates as conditions change.

These guidelines take the recommendations from the U.S. Centers for Disease Control and Prevention (CDC) into account, in addition to local and state laws and requirements. The following principles are the basis of the operational guidelines presented in this Safety Plan:

- Apply operational decisions consistent with applicable orders, requirements, and regulations.
- Require anyone who is sick to stay home.
- Focus on efforts to protect all employees.
- Require employees and visitors to self-check prior to entry.
- Evaluate guidelines and communication protocols for those buildings with common areas not in Anchor QEA's control.
- Clean, disinfect, and evaluate ventilation systems.
- Provide sustainable supplies of hand sanitizer, disinfectant wipes, and other personal cleaning supplies.
- Communicate immediately to office staff, visitors, and building management of a primary exposure situation as appropriate.
- Implement contact tracing of employees who have been confirmed or presumptive confirmed.
- Continue field work in accordance with this Safety Plan.
- Field programs will follow this Safety Plan unless the client, prime contractor, federal, state, or local government establish more restrictive measures, in which case the more restrictive measures will be followed.
- Updated information can be found at the CDC website (<https://www.cdc.gov/>), as well as state and local health agency websites.
- Field project schedules, modifications, and regulatory requirements will be discussed with the client representatives.
- All personnel have Stop Work Authority.

## 2 Plan Requirements

The objective of this Safety Plan is to provide operational guidelines that address pandemics and epidemics in addition to maintaining consistency in Anchor QEA's response actions across the organization.

If you have questions or concerns, please direct those to your Office Lead, Staff Manager, Project Manager, or H&S Program Lead.

Some site owners or prime contractors may conduct temperature readings or screening prior to entering an office or site, which is in accordance with some current guidance. Some site owners or prime contractors may want to record actual temperature readings, test results, or information other than general "yes" or "no" questions related to travel, symptoms, vaccination status, or other items. If you choose not to participate in the recording of screening information, the site owner or prime contractor may not allow you to access the site. You should immediately contact your Field Lead, Staff Manager, or Project Manager to discuss alternative work and available options.

### Prior to Coming to Work

If an employee has had close contact with a confirmed case within the prior 10 days, we require that they be cleared by WorkCare through the screening process:

- **Regardless of vaccination status, if employees feel that they are sick or showing symptoms, they are required to stay home and not report to work (office or field).**
  - If employees are showing symptoms, they are to contact WorkCare and/or their healthcare provider for medical advice. If employees feel the need to visit a medical professional, it is recommended that the medical office be contacted first to determine when it is appropriate to visit.
  - They should call their Staff Manager immediately and notify them that they are sick. Showing up to work with symptoms will result in the employee being asked to leave to avoid potentially exposing others to an infectious disease.
- If employees show any symptoms while at work, they will be asked to leave and not return until they have been cleared by WorkCare.
- Exposure to, or close contact with, means being within 6 feet of an individual for 15 minutes or greater in a 24-hour period or being exposed to their cough or sneeze.
- If you meet the criteria listed for Primary or Secondary exposure listed in the Case Response section, you should take the following measures:
  - Do not report to work until cleared by WorkCare.
  - Contact your Staff Manager and Health and Safety.

- If masks (i.e., N95 or KN95) are used, they should be used in accordance with the Occupational Safety and Health Administration (OSHA) standard 1910.120, stating, in part, that the user must be fit-tested and in a surveillance program. However, if employees wish to provide their own N95 or KN95 mask, they must complete appropriate acknowledgements with Health and Safety prior to use.

## **Vaccination Policy**

People are considered fully vaccinated 2 weeks after they have received the second dose in a two-dose series, or 2 weeks after they have received a single-dose vaccine. People are asked to maintain current vaccination by receiving a booster dose when eligible.

At this time, Anchor QEA does not require employees to be vaccinated except where required by law or regulation. However, there are locations and projects that may require additional vaccinations or an approved accommodation. In those cases, Anchor QEA will follow those requirements and only assign employees who meet the necessary requirements. For employees to be considered fully vaccinated against an infectious disease, their information must be uploaded to the WorkCare screening portal or recorded in other designated locations.

## **Screening**

A daily self-check protocol is being instituted to replace the daily screening through WorkCare in an attempt to prevent sick or symptomatic employees from coming to work and spreading infection. Employees will self-check themselves for any symptoms that could be consistent with an infectious disease as listed in this plan or by CDC. If an employee has symptoms that could be consistent with disease, they are not to report to work, and if already at work, they should notify their Staff Manager and Health and Safety or Human Resources and return home. They should complete a Risk Stratification Survey through WorkCare and not return until cleared. Employees who report for work are stating that they do not have symptoms that could be consistent with an infectious disease, or they have been cleared by a healthcare professional.

## **Visitors**

- Visitors are allowed; however, if they have any symptoms that could be consistent with an infectious disease they should not visit.
- Meetings with outside parties should take place virtually, when possible.
- Delivery personnel must follow all current protocols.



## Case Response

According to the CDC, symptoms can appear 2 to 14 days after exposure. Symptoms or combinations of symptoms that may be consistent with an infectious disease include the following:

- Fever (100.4°F [37.8°C] or greater) or chills
- Cough
- Shortness of breath or difficulty breathing
- Fatigue
- Muscle or body aches (longer than 48 hours)
- Headache
- Sore throat
- Congestion or runny nose
- Nausea or vomiting
- Diarrhea
- New loss of taste or smell
- Positive test

If you have symptoms that are consistent with the above or others designated by CDC but have not tested positive, regardless of vaccination status, you are to not go into work until you have been cleared to return by WorkCare. Immediately contact your Staff Manager and Health and Safety or Human Resources. You should additionally contact the Project Manager if working in the field for a project.

Regarding exposures, there are two general scenarios that now apply, as follows:

- 1. Primary Exposure:** These are employees who have tested positive for or have symptoms consistent with an infectious disease. If you have tested positive for an infectious disease, you must be in self-isolation and those with whom you have had close contact in the work environment within the time specified by the CDC and/or WorkCare will be notified. Health and Safety will work with the Office Lead and Human Resources to notify the Anchor QEA employees (and building management if applicable) who were identified. Project Managers will be responsible for notification of clients and other contractors with whom you were in close contact. You must not return to work until you have been cleared by WorkCare. The exception to this would be if your primary physician recommends more restrictive measures.
- 2. Secondary Exposure:** These are employees who, within the time specified by the CDC and/or WorkCare, have had close contact with someone who has tested positive for an infectious disease or has symptoms consistent with an infectious disease. You must follow the direction of WorkCare and may not return to work until cleared by WorkCare. If you start to have symptoms or test positive, follow the appropriate guidance for Primary Exposure noted above.

In the event there is a documented case of an employee becoming infected with an infectious disease or symptoms consistent with an infectious disease (Primary Exposure), management will take immediate action as follows:

- The employee should be immediately self-isolated until they have been cleared by WorkCare.
- Notify the Staff Manager, Health and Safety, and Project Manager (if in the field) immediately.
- The employee will identify those with whom they have had close contact in the work environment within the time specified by CDC and/or WorkCare.
- Employees who came in close contact with the individual will be notified. Health and Safety will work with the Office Lead and Human Resources to notify the Anchor QEA employees who were identified. Project Managers will be responsible for notification of clients and other contractors with whom the individual was in close contact.
- Confidentiality for the employee should be maintained.

If an employee has had close contact with someone diagnosed with an infectious disease (Secondary Exposure) within the current time specified by the CDC and/or WorkCare, the Staff Manager, Office Lead, and/or Health and Safety will take immediate action as follows:

- If the employee is asymptomatic, have them wear a well-fitting face covering until 10 days have passed since the exposure.
- If the employee tests positive or develops symptoms, this becomes a Primary Exposure scenario, and that guidance should then be followed.

## **Workplace Requirements**

All work locations are to follow the guidance in this document at a minimum. In locations where state or local requirements require specific plans, forms, risk evaluations, or other documents, those documents will be prepared for those specific instances. For field projects, follow the site-specific Health and Safety Plan personal protective equipment (PPE) requirements in addition to this document.

## **Travel Considerations**

Travel will be considered based upon the current levels of transmission, restrictions, and overall risk to the employees at the time. They may range from no restrictions to stopping all travel.

- Employees must follow the same prevention guidelines off site, which includes travel, hotel, and other activities, to address potential exposures outside the workplace.
- When at hotels, consider disinfecting your own room with U.S. Environmental Protection Agency (EPA)-registered cleaners or alternatives, and consider using the “No Housekeeping” sign to minimize the people coming into your room.
- When traveling, follow all requirements in place for the location(s) that you visit, including any requirements for transportation to include air travel.

## Face Covering and Physical Distancing Requirements

- As always, regardless of whether required at the time, individuals are permitted to wear a face covering if they desire as long as there is no safety risk.
- In some instances, a location, local area, or state may have more restrictive requirements in place. All individuals must follow the more restrictive requirements in those cases.
- Those who are at high or increased risk should consult with their healthcare provider about whether they need to wear a mask/face covering or take other precautions.
- Physical distancing, 6 feet or greater, is also an effective method to reduce the risk associated with contracting an infectious disease.
- All employees should have a face covering available in case they are requested to wear one when in close contact or enclosed situations.

## Designated Coordinators

Anchor QEA will designate the following Coordinators in the workplace:

- For office locations, the Office Lead will be the Coordinator with support from the H&S Office Representative(s).
- For field sites, the Field Lead or Senior Person will be the Coordinator with support from the Project Manager.
- The H&S Program Lead and H&S Coordinator(s) will be the Corporate Coordinators with support from the Task Force and Managing Committee.

The responsibilities of the Coordinators are as follows:

- Ensure that information on required workplace safety protocols is provided to employees and all other individuals likely to be present at workplaces.
  - Communicate the required workplace safety protocols and related policies by email, websites, memoranda, flyers, or other means, and post signage at covered workplaces that sets forth the requirements and workplace safety protocols in a readily understandable manner as necessary.
  - This includes communicating the workplace safety protocols and requirements related to face coverings and physical distancing to visitors and all other individuals present at workplaces.
- If the designated Coordinator (or support person) becomes aware of individuals failing to comply with the requirements established at that time, do the following:
  - Ask the individual to comply.
  - If they still do not wish to comply, ask them to leave the workplace.
    - If they are a visitor ensure their company is notified.
    - If they are an employee notify Human Resources.

- If a location has more restrictive requirements, individuals will follow the more restrictive requirements.

The Corporate Coordinators will also be responsible for the following:

- Work with WorkCare and/or others to maintain proper vaccination documentation as appropriate.
- Provide support to the office and field Coordinators.

## Prevention and Cleaning Requirements

An important step to control spread of the virus in the workplace focuses on hygiene and cleaning:

- All employees and management staff will follow CDC guidance regarding hand washing: <https://www.cdc.gov/handwashing/index.html>. Sanitizing wipes or gel will be made readily available around the office.
- All employees will be responsible for multiple daily cleaning of high-touch surfaces.
- Employees should follow published guidance to limit transmission outside of and at work: <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/prevention.html>.
- The following link provides a list of EPA-recommended cleaning products able to kill the virus, as well as some initial guidance with alternatives if supplies run out: <https://cfpub.epa.gov/wizards/disinfectants/>. If these products are not available, then either a diluted bleach solution or 70% alcohol solution will work. The following link provides general recommendations for routine cleaning and disinfection: [https://www.cdc.gov/coronavirus/2019-ncov/community/disinfecting-building-facility.html#anchor\\_1617548446719](https://www.cdc.gov/coronavirus/2019-ncov/community/disinfecting-building-facility.html#anchor_1617548446719).
- Catch coughs and sneezes with a disposable tissue, etc. and throw away, then wash hands. If tissues are not available, direct coughs and sneezes into elbow.
- Avoid touching your own mouth, nose, or eyes.
- All employees will have their own PPE and will not share with others. Respirators and PPE will be cleaned/disinfected when doffing, along with a thorough arm, hand, and face washing when exiting.

## Disinfection

- A sustainable supply of disinfectant wipes will be available for employees to wipe down surfaces that are touched in restrooms and other common areas when they leave the area.
- Staff Managers should still maintain regular contact with personnel even when they return to the office.

**Table 1**  
**Supply Recommendations**

| Item                                                  | Specifications                                                                                                                                                                                                                                                | Required On-Hand Quantity*                           |
|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|
| Face coverings                                        | Face coverings meeting CDC guidelines. Employees are responsible for their own face coverings and cleaning because use outside the office (on the bus, at the store, getting coffee, on the elevator) is important to avoid bringing the virus to the office. | Anchor QEA will provide face coverings as necessary. |
| Gloves                                                | Disposable gloves of sufficient material to be used when cleaning common touch surfaces                                                                                                                                                                       | Sustainable supply                                   |
| Disinfectant spray or wipes                           | Wipes or manufactured disinfecting material. If using a solution, it must meet EPA guidance and be made fresh daily.                                                                                                                                          | Sustainable supply                                   |
| Hand sanitizer and motion sensor-activated dispensers | Hand sanitizer meeting CDC guidelines                                                                                                                                                                                                                         | Sustainable supply                                   |
| Hand soap                                             | Premanufactured soap available at various sink locations                                                                                                                                                                                                      | Sustainable supply                                   |
| Paper towels                                          | Rolls or refills for hand towel machines that are already in place or are installed prior to opening                                                                                                                                                          | Sustainable supply                                   |
| Spray bottles                                         | Spray containers for use with disinfectant solutions that are mixed on site                                                                                                                                                                                   | As needed; sustainable supply                        |

Note:

\*Required On-Hand Quantity must be maintained in a sustainable supply. When quantities drop to a critical level and quantities cannot be immediately increased, appropriate actions should be taken.

**Table 2**  
**Office Responsibilities**

| <b>Responsibility</b>                       | <b>Responsible Person(s)</b>                                            | <b>Comments</b>                         |
|---------------------------------------------|-------------------------------------------------------------------------|-----------------------------------------|
| Tracking State Requirements                 | Office Lead or Project Manager                                          |                                         |
| Office Reclosure                            | Office Lead, Anchor QEA Managing Committee, and/or H&S Program Lead     | "Stop Work" can be applied as necessary |
| Office Access                               | Office Lead                                                             |                                         |
| Workspace Configurations                    | Office Lead or Project Manager                                          |                                         |
| Shared Areas                                | Office Lead or Project Manager                                          |                                         |
| Staff Office Rotations                      | Office Lead or Project Manager                                          | If needed                               |
| Screening (Staff/Visitors) – Oversight      | Office Lead or Project Manager                                          |                                         |
| Local Field Project Staffing                | Regional Leads, Project Managers, and Health and Safety                 |                                         |
| Cleaning – Oversight                        | All                                                                     |                                         |
| Exposure Response (Source Tracing)          | Health and Safety or Human Resources and Office Lead or Project Manager |                                         |
| Office Procedures – Review and Modification | H&S Program Lead or Human Resources and Office Lead or Project Manager  | If needed                               |

### 3 Source Materials

CDC (Centers for Disease Control and Prevention), 2021. CDC website: [cdc.gov](https://www.cdc.gov).

Lear Corporation, 2020. *Safe Work Playbook: An interactive guide for COVID-19 Pandemic Preparedness and Response Second Edition*. June 26, 2020.

Lotito, M.J., M.J. Ackie, and B.J. Sarchet, 2020. *Back to Work? Assessing Whether, When and How to Re-Open for Business*. Littler Workplace Policy Institute. Webinar. April 27, 2020.

Safer Federal Workforce Task Force, 2021. *COVID-19 Workplace Safety: Guidance for Federal Contractors and Subcontractors*. September 24, 2021. Available at:  
[https://www.saferfederalworkforce.gov/downloads/Draft%20contractor%20guidance%20doc\\_20210922.pdf](https://www.saferfederalworkforce.gov/downloads/Draft%20contractor%20guidance%20doc_20210922.pdf)

# Appendix F

## Field Program Heat Exposure Management Plan

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# Field Program Heat Exposure Management Plan

**Date:** \_\_\_\_\_  
**Project No:** \_\_\_\_\_  
**Project Name:** \_\_\_\_\_

This Field Program Heat Exposure Management Plan (Plan) is an addendum to the existing project-specific Health and Safety Plan (HASP) for field activities. All personnel who have previously signed acknowledging the HASP must sign off acknowledging this Plan. Acknowledgement of this Plan will be included with future acknowledgements of the overall HASP. This Plan is intended to be used primarily from May to September of each year; however, depending on temperatures it may also be needed during other months.

Heat-related illnesses can happen if workplace activities in a hot environment overwhelm the body's ability to cool itself. This becomes more likely if any of the risk factors are present. Examples include working in a hot environment without adequate access to water for rehydration, working in protective gear that does not allow air circulation across the skin, or working where the humidity is too high for sweat to evaporate.

This Plan should be applied for anyone working outdoors more than 15 minutes in any 60-minute period in heat index temperatures:

- As low as 52°F when wearing clothing that is non-breathable or provides a vapor barrier like rain gear, chemical resistant suits, or Level A suits
- Starting at 77°F when wearing double layer woven clothing like sweatshirts, coveralls, and jackets on top of other clothes
- At 80°F when wearing any other type of clothing like typical shirts and pants

Some individuals are more susceptible to heat stress than others—for example, individuals who are not acclimatized or who come to work dehydrated.

## Prevention Measures

The field team shares responsibility for safety at the work site. This includes watching out for yourself and others because heat illness can become a life-threatening condition quickly if unnoticed or ignored. Speak up if you notice anything that could be unsafe or result in someone getting hurt or sick.

## Set up the Work Site for Shade

Before work begins, the Field Lead will assess shade options for the work site. Shade such as trees, walls, or structures like a portable canopy can be used. Fans can help if the air temperature does not go above 95°F, but if air-conditioned spaces are available, like cabs, they can be used to cool individuals off. The Field Lead is responsible to ensure that equipment is available, functional,

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## Field Program Heat Exposure Management Plan

transported, and set up properly. The shade area must either be open to the air or provide mechanical ventilation for cooling.

The amount of shade present must be at least enough to accommodate the number of staff on recovery or rest periods, so that they can sit in a normal posture fully in the shade. The shade must be located as close as practical to the areas where staff are working. Shade present during meal periods must be large enough to accommodate the number of staff on the meal period that remain on site. If shade cannot be provided due to safety or feasibility concerns, alternative cooling measures must be implemented.

### Schedule Work to Reduce Heat Exposure

The Field Lead, in coordination with the Project Manager, will consider changes to shift timing to avoid working during the hottest period of the day. This could include starting earlier, working in the evening, or splitting the day with a break during the hottest part of the day.

### Stay Hydrated

Do not wait to be thirsty to drink water, and do not drink it all at once. In fact, it is best to start drinking water before work. Drink small amounts often throughout the day to stay hydrated. Additional water breaks are allowed during hot days. Potable water should be cool (66°F to 77°F) or cold (35°F to 65°F). During moderate activity, in moderately hot conditions, staff should drink about 8 ounces of liquid every 15 to 20 minutes.

Sports drinks low in sugar are okay but should not completely replace water. Avoid drinks with caffeine and high sugar content like sodas because they will not hydrate you.

There should be enough water to allow each staff member to drink at least a quart of water each hour. (Drink at least 1 cup every 15 to 20 minutes.)

The Field Lead will ensure that water is available to staff and that it is consumed on a regular basis.

Encourage staff to eat regular meals and snacks because these provide enough salt and electrolytes to replace those lost through sweating if enough water is consumed.

### Allow Time to Adjust to Heat (Acclimatization)

It takes about 2 weeks to fully adjust to hot working conditions. This adjustment is lost if you are away from the hot conditions for a week or more. Acclimatization is especially critical for heavy work in hot temperatures.

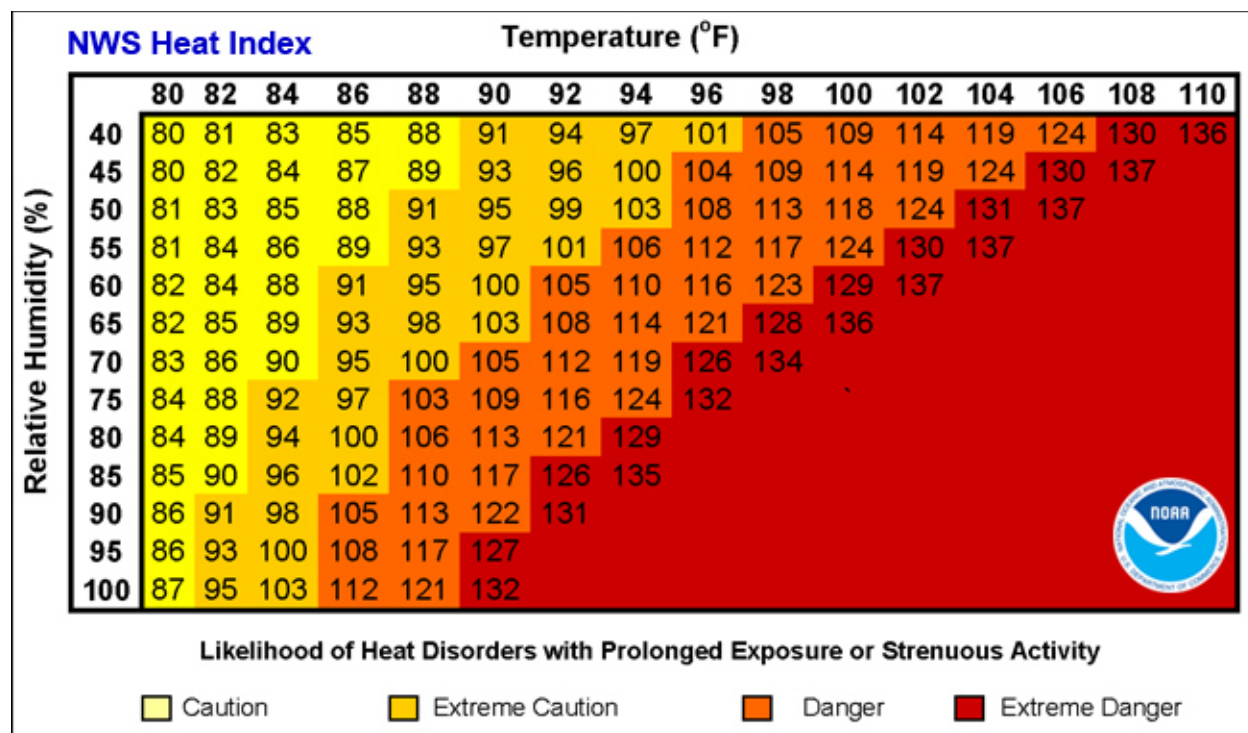
Start with light physical work and/or short durations of work time, and slowly increase each day. Increase by 20% (of the total shift) each day for non-acclimatized staff.

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## Training

Each year, staff who may encounter the working conditions listed above will be provided with safety training on the dangers of outdoor heat exposure, the steps we take to protect them, and actions they must follow to prevent heat-related illness. This information will additionally be covered in tailgate meetings at the project site.



Source: <https://www.weather.gov/images/safety/heatindexchart-650.jpg>

## High Heat Practices

The following additional high heat practices must be implemented when the ambient heat index exceeds 90°F:

- Ensure that effective communication by voice, observation, or electronic means is maintained so that staff at the work site can contact a Supervisor when necessary. An electronic device, such as a mobile phone or text messaging device, may be used for this purpose only if reception in the area is reliable.
- Ensure that staff are observed for alertness and signs and symptoms of heat illness and monitored to determine whether medical attention is necessary by implementing one or more of the following:
  - Establish regular communication with staff working alone, such as by radio, mobile phone, or other alternative means.

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- Create a mandatory buddy system.
  - Implement other equally effective means of observation or communication.
- The Field Lead must designate and equip one or more staff on the work site as authorized to call for emergency medical services and must allow other staff to call for emergency services when designated staff are not immediately available (such a practice supplements existing requirements to ensure that emergency medical care is immediately available in all workplaces).
- The Field Lead must ensure that each staff member takes a minimum 10-minute preventative cool-down rest period in the shade at least every 2 hours, regardless of the overall length of the shift.

## Responding to Heat-Related Illness

Let a Supervisor or someone nearby know if you or a coworker are experiencing any signs or symptoms of heat-related illness and take immediate action to ensure things do not get dangerously worse.

- Time is critical. Get the individual away from the hot area into a cool shaded area. Quick action increases the chances for a full recovery.
- Let the individual rest and drink cool water.
- Remove any PPE as appropriate.
- Use ice packs or cooling towels as appropriate and available.
- Never leave an individual who is experiencing heat-related problems alone; things could get worse.
- If the individual is a lone worker, an Anchor QEA representative will stay on the line with the individual. Also, in the case of a lone worker, emergency services will be called to the location of the individual unless an Anchor QEA representative or representative of another company can quickly arrive at the location.
- If the individual does not respond quickly, call emergency medical services.
- Follow the steps in the main HASP document for notifying emergency services to include directions to the site.
- If the individual is in a remote or non-developed area with unidentified roads, you may need to have someone meet emergency services at the closest point to guide them to the victim's location.
- Notify Health and Safety.

If the individual receives medical attention, a written authorization must be obtained from the provider indicating that the individual can get back to work and whether there are any restrictions or limitations.

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## Risk Factors

The following are environmental risk factors for heat illness:

- Air temperature above 90°F
- Relative humidity above 40%
- Radiant heat from the sun and other sources
- Conductive heat sources such as dark-colored work surfaces
- Lack of air movement
- Physical effort needed for the work
- Use of nonbreathable protective clothing and other Personal Protective Equipment (PPE)

The following are personal risk factors for heat illness:

- Lack of acclimation to warmer temperatures
- Poor general health
- Dehydration
- Alcohol consumption
- Caffeine consumption
- Previous heat-related illness
- Use of prescription medications that affect the body's water retention or other physiological responses to heat such as beta blockers, diuretics, antihistamines, tranquilizers, and antipsychotics

## Heat-Related Illnesses

### Heat Rash

Heat rash is the most common health problem in hot work environments. It is caused by sweating and looks like a red cluster of pimples or small blisters. Heat rash usually appears on parts of the body that overlap or rub other parts of the body, such as in the groin area, under the arms or breasts, and in knee or elbow creases. If an individual has symptoms of heat rash, provide a cooler, less humid work environment, if possible. Advise the individual to keep the area dry and not to use ointments and creams that make the skin warm or moist, which can make the rash worse.

### Heat Exhaustion

Heat exhaustion can best be prevented by being aware of one's physical limits in a hazardous environment on hot, humid days. The most important factor is to drink enough clear fluids (especially water, not alcohol or caffeine) to replace fluids lost to perspiration. Signs and symptoms of heat exhaustion typically include the following:

- Profuse sweating

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- Weakness and fatigue
- Nausea and vomiting
- Muscle cramps (associated with dehydration)
- Headache
- Light-headedness or fainting (fainting or loss of consciousness is potentially serious and should be treated as a medical emergency)

When you recognize heat exhaustion symptoms in an individual, you must intervene; stop the activity, and move the individual to a cooler environment. Cooling off and rehydrating with water (or electrolyte-replacing sports drinks) is the cornerstone of treatment for heat exhaustion. If the individual resumes work before their core temperature returns to normal levels, symptoms may quickly return.

If there is no intervention and the body's temperature regulation fails, heat exhaustion can rapidly progress to heat stroke, a life-threatening condition!

### Heat Stroke

Heat stroke requires an immediate emergency medical response. The individual may stop sweating, become confused or lethargic, and may even have a seizure! The internal body temperature may exceed 106°F. Signs and symptoms of heat stroke typically include the following:

- Absence of sweating
- Dry skin
- Agitation or strange behavior
- Dizziness, disorientation, or lethargy
- Seizures or signs that mimic those of a heart attack

Ensure that emergency responders are summoned immediately if heat stroke is suspected. While waiting for emergency responders to arrive, cool the individual; move the individual to an air-conditioned environment or a cool, shady area, and help the individual remove any unnecessary clothing. Do not leave the individual unattended. Heat stroke requires immediate medical attention to prevent permanent damage to the brain and other vital organs that can result in death.

### Responsibilities

Staff need to be aware of the following:

- How heat can make them sick, and how to recognize the common signs and symptoms of heat-related illness in themselves and coworkers. The four most common conditions are heat rash, heat cramps, heat exhaustion, and heat stroke.

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- The environmental factors that increase risk for heat-related illness such as higher temperatures, humidity, sunlight (working under direct sunlight makes it feel about 15 degrees hotter), additional sources of heat like powered equipment and asphalt, no wind, level of physical activity, and wearing of PPE or layers of clothing
- Personal factors that may increase susceptibility to heat-related illness including age, not being acclimatized, having medical conditions such as hormonal and heart issues and diabetes, dehydration, and use of substances that can affect the body's response to heat like drugs, alcohol, caffeine, nicotine, and medications
- The importance of removing heat-retaining PPE such as non-breathable chemical resistant clothing during all breaks to allow the body to cool down
- How to stay well hydrated by drinking small quantities of water or other acceptable beverages frequently throughout the day
- The importance of acclimatization (to get used to the conditions). It takes about 5 days to start and 2 weeks to be fully acclimated
- How to immediately report signs or symptoms of heat-related illness they experience or observe in coworkers, and how to immediately respond to prevent the situation from becoming a medical emergency. How to identify and what to do during a heat-related medical emergency (e.g., potential heat stroke)

Supervisors need to know the following (in addition to what is detailed for staff above):

- The procedures to follow to implement the heat-related illness prevention plan, including the acclimatization schedule, how to keep track of environmental conditions throughout the day, when to increase the number of breaks or stop work early, checking that staff are accessing shade and water (especially for mobile operations), encouraging them to stay hydrated, and communicating with lone workers to ensure they are safe. The free OSHA-NIOSH Heat Safety Tool app could be helpful: <https://www.cdc.gov/niosh/topics/heatstress/heatapp.html>
- When to provide PPE like cooling vests and gel-filled bandanas
- What the Supervisor needs to do if an individual shows signs and symptoms of possible heat-related illness, including appropriate emergency response procedures and how to transport any affected staff to a medical service provider

## Sources

<https://osha.oregon.gov/OSHAPubs/pubform/heat-sample-program.pdf>

<https://www.lni.wa.gov/safety-health/docs/HRIAPPAddendum.doc>

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# Field Program Heat Exposure Management Plan



## Heat Exposure Management Plan Acknowledgement

Project Number: \_\_\_\_\_

Project Name: \_\_\_\_\_

My signature below certifies that I have read and understand the policies and procedures specified in this Field Program Heat Exposure Management Plan.

| Date | Name (print) | Signature | Company |
|------|--------------|-----------|---------|
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