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State of Washington  
Department of Ecology  
PO Box 47600  
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**Subject: Camas Draft Sediment RI WP Submittal**

Ms. Mady Lyon,

Per the requirements of Agreed Order No. DE 18201, Georgia-Pacific submits this the Agency Review Draft Sediment Remedial Investigation Work Plan for your review. The Sampling and Analysis Plan/Quality Assurance Project Plan and Health and Safety Plan are included as appendices to the Agency Review Draft Remedial Investigation Work Plan. Two hard copies will be mailed in accordance with the Agreed Order.

Please do not hesitate to contact me ([shawn.wood@gapac.com](mailto:shawn.wood@gapac.com)) or Matt Tiller ([matt.tiller@gapac.com](mailto:matt.tiller@gapac.com)) if you have any questions.

Sincerely,



Shawn Wood

cc: Spencer Giles, GP  
Matt Tiller, GP

DRAFT

December 2023  
Camas Mill Sediment Remedial Investigation



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# Agency Review Draft Sediment Remedial Investigation Work Plan

Prepared for Georgia-Pacific LLC

DRAFT

December 2023  
Camas Mill Sediment Remedial Investigation

# Agency Review Draft Sediment Remedial Investigation Work Plan

**Prepared for**  
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## ABBREVIATIONS

AO	Agreed Order
ASB	aerated stabilization basin
AST	aboveground storage tank
CBC	Camas Business Center
COPC	chemical of potential concern
CSL	cleanup screening level
CSM	conceptual site model
DMMU	dredged material management unit
DQO	data quality objective
Ecology	Washington State Department of Ecology
GP	Georgia-Pacific LLC
mg/kg	milligram per kilogram
MSL	mean sea level
MTCA	Model Toxics Control Act
ng/kg	nanogram per kilogram
NPDES	National Pollutant Discharge Elimination System
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PFAS	per- and polyfluoroalkyl substances
RI	remedial investigation
RIWP	remedial investigation work plan
RSET	Regional Sediment Evaluation Team
SCO	sediment cleanup objective
SCUM	<i>Sediment Cleanup User's Manual (SCUM): Guidance for Implementing the Cleanup Provisions of the Sediment Management Standards</i>
Sediment RIWP	<i>Agency Review Draft Sediment Remedial Investigation Work Plan</i>
Site	Camas Mill Site
SL1	screening level 1
SMS	Sediment Management Standard
SOU	Site Operational Unit
SQAPP	<i>Sediment Sampling and Quality Assurance Project Plan</i>
SR-14	State Route 14
Study Area	portion of the Camas Slough adjacent to the Camas Mill operations
TEQ	toxicity equivalence
TPH	total petroleum hydrocarbons

Upland RIWP	<i>Agency Review Revised Draft Remedial Investigation Work Plan for Upland Areas</i>
USACE	U.S. Army Corps of Engineers
UST	underground storage tank
WAC	Washington Administrative Code
WWTP	wastewater treatment plant

# 1 Introduction

This *Agency Review Draft Sediment Remedial Investigation Work Plan* (Sediment RIWP) presents the scope of work for the remedial investigation (RI) of in-water areas adjacent to the Georgia-Pacific LLC (GP) Camas Mill property (Figure 1-1). The Site is identified by the Washington State Department of Ecology (Ecology) as Facility Site ID No. 66765272 and Cleanup Site ID No. 15156. In-water investigation and cleanup activities at the Site will be conducted under the regulatory framework of the Model Toxics Control Act (MTCA; Washington Administrative Code [WAC] 173-340) and the Sediment Management Standards (SMS), WAC 173-204.

GP and Ecology entered Agreed Order (AO) No. DE 18201 on August 12, 2021, to develop a site-wide RIWP and prepare an RI report per WAC 173-340-350 and WAC 173-204-550. This Sediment RIWP supplements the *Agency Review Revised Draft Remedial Investigation Work Plan for Upland Areas* submitted to Ecology on March 3, 2023 (Upland RIWP; Kennedy Jenks 2023). Accordingly, this Sediment RIWP includes compilation of information related to potential impacts to sediment and water quality, a preliminary conceptual site model (CSM) focused on pathways and receptors in the aquatic environment, an evaluation of data gaps pertaining to sediment and surface water quality, and a plan to achieve data quality objectives (DQOs) necessary to complete the Sediment RI. This Sediment RIWP includes a phased approach to addressing data gaps and will initially focus on the portion of the Camas Slough adjacent to the Camas Mill operations (Study Area; Figure 1-1). The boundaries of the Study Area will be adjusted as needed based on data generated by the upland RI and initial sediment RI activities.

Appendices to this Sediment RIWP include a *Sediment Sampling and Quality Assurance Project Plan* (SQAPP; Appendix A) and Health and Safety Plan (Appendix B). This Sediment RIWP and SQAPP were prepared consistent with the provisions of the SMS and the *Sediment Cleanup User's Manual (SCUM): Guidance for Implementing the Cleanup Provisions of the Sediment Management Standards* (SCUM; Ecology 2021a). The SQAPP follows Ecology's *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies* (Ecology 2004) and related U.S. Environmental Protection Agency guidance.

This Sediment RIWP is organized as follows:

- Section 1 presents an overview and describes the purpose of the Sediment RIWP.
- Section 2 discusses the historical and current information relevant to assessing potential impacts to sediment and water quality in the Study Area from mill operations and around Lady Island due to log storage activities.
- Section 3 presents the preliminary CSM, identifies data gaps, and DQOs for the Sediment RI.
- Section 4 outlines the Sediment RI activities, including reconnaissance and Phase I and Phase II sampling events.
- Section 5 outlines the preliminary project schedule through submittal of a draft Sediment RI report.

## 2 Information Relevant to the Sediment Remedial Investigation

This section summarizes available information relevant to assessing potential impacts to sediment and water quality from historical and current uses of the property.

### 2.1 General Site Setting

The upland property is located at 401 Northeast Adams Street in Camas, Washington, along the Camas Slough and Columbia River, which is the boundary between the states of Oregon and Washington (Figures 1-1 and 1-2). The upland property is bordered by the Washougal River to the east, which flows south to its confluence with the Camas Slough. The southern extent of the upland property is bordered by the Camas Slough and Columbia River; the Camas Slough separates the Main Mill area from Lady Island. A residential area is located to the west, and the downtown City of Camas borders the upland property to the north. Washington State Route 14 (SR-14) travels over the Camas Slough and through Lady Island.

The upland property includes approximately 661 acres across six Site Operational Units (SOUs): Woodyard (SOU-A), Main Mill area – North (SOU-B), Main Mill area – South (SOU-C), Lady Island (SOU-D), Ancillary Area (SOU-E), and Camas Business Center (CBC; SOU-F). Upland RI activities in the six SOUs are described in the Upland RIWP and are being led by Kennedy Jenks. The Study Area comprises the Camas Slough adjacent to upland SOUs A, C, and D, as shown in Figure 2-1. The extent of the Study Area will be further refined using data from the Upland RI and Sediment RI activities.

Upland property conditions—including topography, climate, geology, hydrogeology, and hydrology—are discussed in Section 2 of the Upland RIWP (Kennedy Jenks 2023). To supplement this information, a reconnaissance survey was conducted by GP and Anchor QEA, LLC, on October 2, 2023. Features of the Study Area around Lady Island and throughout the Camas Slough were observed, photographed, and logged from a boat. The survey revealed mostly rocky outcrops and portions of engineered riprap on the south side of Lady Island, with the exception of the southwestern portion, which comprises a long, narrow sandy beach. Sandy and muddy beaches with limited rock outcrops are present on the north side of Lady Island. Sandy sediments are present on the western side of the island, whereas smaller silt-sized particles occur on the eastern side of the slough. The northwestern portion of the Lady Island shoreline is undeveloped and characterized by segments of cobbly beaches and steep rock faces at the shoreline. Derelict pilings and dolphins are present along the north and south shorelines of the slough. Water levels were too shallow to survey east of the Camas Mill process wastewater effluent pipeline; therefore, in-water observation adjacent to the SOU-C shoreline was not feasible during this survey. These shallow conditions are evident in the bathymetry shown in Figures 2-2 and 2-3. Photographs 2-1 through 2-5 illustrate the observed shoreline conditions.



**Photograph 2-1**  
**Shoreline Segment Along Southeast Lady Island: Outcrop and Pocket Beach**



**Photograph 2-2**  
**Shoreline Segment Along Southeast Lady Island: Engineered Riprap**





**Photograph 2-3**  
**Shoreline Segment Along Southwest Lady Island: Sandy Beach**



**Photograph 2-4**  
**Shoreline Segment Along Northwest Lady Island: Beach and Nearshore Vegetation**



**Photograph 2-5**  
**Effluent Pipe Crossing Along Northeast Lady Island**





## 2.2 Stormwater and Process Water Management

GP currently manages stormwater and process wastewater under the National Pollutant Discharge Elimination System (NPDES) Waste Discharge Permit No. WA0000256, which includes a wastewater treatment system (WWTP) and Outfalls 001, 002, and 004 (Figure 2-2). Table 2-1 summarizes the influent water managed via each outfall. The Upland RIWP provides details regarding the configuration, operation, and monitoring of the WWTP, which includes a primary clarifier and two aeration stabilization basins (ASBs). In addition to the outfalls operated under GP's NPDES permit, the City of Camas discharges stormwater to the Camas Slough (Figure 2-2).

**Table 2-1**  
**Summary of Current and Historical NPDES Outfalls**

Outfall	Status	Receiving Waterbody	Influent Water
001	Active	Columbia River	Beginning in 1968, industrial stormwater and process water from SOU-A, SOU-B, and SOU-C has been captured and conveyed via sewers to the Lady Island water treatment system for treatment prior to discharge.
002	Active	Camas Slough	Clearwell overflow and non-industrial stormwater from the City of Camas and the CBC is directly discharged. Until 2016, filter plant backwash was also discharged (Ecology 2021b).
003	Inactive	Washougal River	Historically used as a sand trap purge from the well field located in the southeast corner of the mill. In 2002, GP notified Ecology of their intent to route this flow to Outfall 001 (Ecology 2015).
004	Active	Camas Slough	Added to permit in 2018 to allow for direct discharge of non-contact, freshwater discharge from the fire water emergency pump system.
South ASB Bypass	Inactive	Columbia River	Former outfall that served as an overflow bypass for water contained within the South ASB prior to WWTP construction.
South ASB Outfall	Inactive	Columbia River	Former outfall for wastewater treated in the ASBs prior to construction of the WWTP primary clarifier.

Wastewater treatment began at Lady Island when the first treatment basin was installed between 1956 and 1961 (GP 2020). The treatment basin, currently known as the South ASB, was formerly used as a sulfite liquor lagoon and converted to an ASB in 1975 (Kennedy Jenks 2023). In 1967, the primary clarifier was installed for primary treatment, and the North ASB was installed in 1977 for secondary treatment (along with the South ASB). The WWTP at Lady Island treats process wastewater and stormwater from the property; it is conveyed from the upland property at the Effluent Pump Station under the Camas Slough and treated prior to discharge at Outfall 001 (GP 2020).

Prior to the early 1940s, Camas Mill process wastewater and stormwater were discharged via natural drainage (Photograph 2-6). Thereafter until 1960, discharges occurred via outfalls adjacent to the current Outfall 002 (Photograph 2-7). Photographs 2-8 and 2-9 show the configurations of the WWTP in 1980 and 2017, respectively, during which all process wastewater and stormwater was captured and conveyed via sewers to Lady Island.

**Photograph 2-6**  
**Camas Slough, 1939**



Source: EDR 2019

**Photograph 2-7**  
**Camas Slough, 1966**



Source: EDR 2019

**Photograph 2-8  
Camas Slough, 1980**



Source: EDR 2019

**Photograph 2-9  
Camas Slough, 2017**



Source: EDR 2019

## 2.3 Log Storage Activities

The Camas Slough and parts of the Columbia River were historically used as log storage areas for Camas Mill operations. Photograph 2-10 illustrates the known historical extents of the log rafting areas around Lady Island.



**Photograph 2-10**  
**Log Storage Around Lady Island, 1951**



Note: View of western Lady Island (top) and view of central Lady Island and Woodyard (bottom)  
Source: EDR 2019

## 2.4 Potential Sources of Contamination from Mill Operations

Historical operations at the Camas Mill may have released contaminants related to pulp and paper production onto the upland portion of the property (Kennedy Jenks 2023). Contaminant migration could have occurred from upland sources based on local hydrogeology and groundwater flow patterns. For upland releases to impact sediment, a pathway between the upland media (i.e., soil and groundwater) and sediment would need to exist. The available sediment data, while limited, do not indicate a migration pathway from potential upland spills or releases. Additionally, wood debris resulting from historical timber operations may have accumulated in the Study Area. Data collected as part of the Upland RI will be reviewed to inform the evaluation of potential contaminant release from historical operations, and, if such releases are identified, migration pathways (i.e., erosion and groundwater plume) will be evaluated for their potential to impact sediments.

This section provides an overview of potential sources of contamination within 100 feet of the Study Area shoreline in dock areas, outfalls, and surface waterbodies that discharge to the Camas Slough. Potential sources more than 100 feet from the shoreline are discussed in the Upland RIWP.

### 2.4.1 *Woodyard (SOU-A)*

As discussed in the Upland RIWP (Kennedy Jenks 2023), the First Woodmill area on the Camas property contained 55- and 250-gallon aboveground storage tanks (ASTs) that stored lubricant oil. The Former Cat Shop and Electric Shop area contained two underground storage tanks (USTs) that were removed in 1985: a 2,000-gallon gasoline UST and a 600-gallon degreaser solvent UST. The Dock Warehouse was historically used for chemical storage, and the area contains a process sewer pump.

Potential historical sources of contamination in the Woodyard area include storage and spills of lubricant oil and petroleum near and into the Camas Slough related to the use and maintenance of machinery and vehicles in facility operations (log processing and chip pile management). Process sewer spills in the area are an additional potential source of contamination.

Documented spills to the Camas Slough within SOU-A include:

- Equipment failures or malfunctions have resulted in releases of petroleum hydrocarbons (diesel and lubricant oil) into the slough. Those spills have typically been small: less than 1 gallon of petroleum hydrocarbons (Liljenquist et al. 2016).
- Process wastewater and industrial stormwater has entered the slough on several occasions because of pump malfunctions or equipment maintenance activities. In one documented case, heavy rains caused wastewater from sumps to overflow into the slough (Liljenquist et. al 2016).

- There are several documented cases where pieces of woodmill cranes or dock equipment fell into the slough (Liljenquist et al. 2016). This equipment could be a potential vector for hydraulic fluids or lubricants.

#### 2.4.2 Main Mill Area – South (SOU-C)

SOU-C encompasses the southern part of the Main Mill area and includes five operational areas that include finishing, coating, product storage, and other operational support activities. These areas are described in more detail in the Upland RIWP.

Operational features within 100 feet of the Camas Slough include the Fuel Oil Storage area, the No. 9 Substation, the Effluent Pump Station, and the Riverbank Pump House. Potential sources of contamination stemming from these operational features include the following:

- Spills, leaks, or releases of petroleum hydrocarbons from ASTs adjacent to the Camas Slough in the Fuel Oil Storage area or from fuel storage, machinery, and pumps in the Effluent Pump Station and Riverbank Pump House
- Spills, leaks, releases, or discharge of petroleum hydrocarbons and process water into the former ditches and current storm drains that discharge into the Camas Slough
- Spills, leaks, or releases of process wastewater in the process sewer pipes and the Effluent Pump Station
- Stormwater discharge from the Camas Mill and the City of Camas to the Camas Slough from the “Blue Creek” drainage ditch<sup>1</sup> and the City of Camas stormwater outfall
- Historical direct discharges or releases into the Camas Slough from upland operational areas
- The use of polychlorinated biphenyls (PCBs) in transformers and herbicides at the No. 9 Substation

Stormwater runoff and spills into the stormwater drainage system have potential to transport contamination into the Camas Slough from the upland areas of the Camas Mill and the City of Camas residential and downtown areas. Historically, stormwater flowed through the lower Main Mill area (Photograph 2-6) via open ditches. The ditches were rerouted and piped through various upgrades to the mill and is currently maintained as Outfall 002. Stormwater has been managed under the mill NPDES permit since 1991. The City of Camas stormwater system collects runoff from areas off site in residential areas and the downtown area and discharges into the slough at Outfall 002 and at the City of Camas stormwater outfall (Figure 2-3).

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<sup>1</sup> The current “Blue Creek” drainage ditch is located within the parcel northwest of the Division Street and Northwest 6th Avenue intersection (i.e., within SOU-F). It receives and conveys stormwater from the CBC and City of Camas. The water is then conveyed primarily via buried pipe through SOU-B and SOU-C prior to discharge at Outfall 002. Historically, until circa the mid-1940s, the ditch was an open conveyance through SOU-C and discharged directly to Camas Slough (Photograph 2-6).

There have been several petroleum hydrocarbon spills from the Fuel Oil Storage area and the Riverbank Pump Station due to equipment leaks. In 1988, a valve flange on the fuel oil No. 6 unloading line in the Fuel Oil Storage area leaked approximately 800 gallons of fuel oil during annual pressure testing, and fuel oil leaked into the slough. The Riverbank Pump Station had two small oil spills (less than 3 gallons) in 1995 and 2003, during which hydraulic or lubricant oil leaked into the slough. In 2006, a fire pump instrumentation failure at the pump station resulted in approximately 48 to 60 gallons of diesel fuel overflowing the day tank, spilling onto the floor, and then leaking into the Camas Slough. A diesel leak from a diesel day tank occurred in 2017 during maintenance work on the mill's well water system, and approximately 50 gallons of diesel may have entered the slough (GP 2017).

The Effluent Pump Station pumps process wastewater to the WWTP on Lady Island and has had several documented releases of wastewater into the slough. Power failures resulted in documented spills of effluent or process wastewater in 1999 and 2006. In 1999, 1 to 2.2 million gallons of effluent were released, and in 2006, process wastewater leaked for 35 minutes to soil and then entered the slough. The flow rate of the 2006 release is unknown. In 2012, the pump station had a 1-gallon-per-minute process sewage leak to soil that entered the slough. The duration of this leak is unknown.

Additional historical spills and releases into the stormwater conveyance system which discharges to the Camas Slough, have been documented. Documented petroleum hydrocarbon spills or leaks have typically been 5 gallons or less and the result of process sewer pipe failures or leaks and storage tank overflows. In 1989, a fuel oil line broke at the steam plant in SOU-B, and approximately 100 gallons of fuel oil spilled. In 2015, a mixture of stormwater and black liquor overflowed from a sewer line vault and entered the system in the SOU-B Power House area (Ecology 2021c). Documented petroleum hydrocarbon leaks into the storm drains (1995 and 1996) have been small (5 to 12.5 gallons) and the result of rainfall runoff carrying leaked oil or fuel to the storm drain and out to the slough (Liljenquist et. al 2016).

### *2.4.3 Lady Island (SOU-D)*

The WWTP operates on Lady Island, located between the Camas Slough and the Columbia River. Process wastewater and stormwater are pumped from the Effluent Pump Station (SOU-B) to the wastewater treatment system and treated using a primary clarifier and ASBs for secondary treatment before being discharged to Outfall 001, on the Columbia River side of the island. Discharge from Outfall 001 is managed under NPDES Industrial Permit WA0000256, first issued in 1991. In compliance with the permit, GP is required to perform surface sediment monitoring at the outfall once per permit cycle. To date, one round of monitoring has been conducted.

A limited-purpose landfill in the northeastern part of Lady Island is managed under a Clark County Public Health Department permit (PT 0006096) and is permitted to receive primary solids, stabilized



secondary solids, and waste wood fiber generated in the papermaking and wastewater treatment processes at the mill (GP 2020). In compliance with the permit, groundwater sampling at the landfill is conducted quarterly, and seep inspections are performed annually. Landfill leachate is treated at the WWTP before being discharged at Outfall 001.

The Dredge Spoils area in the northwestern part of Lady Island contains Camas Slough dredge sediments from maintenance dredging activities and is owned by the U.S. Army Corps of Engineers (USACE). The Dredge Spoils area is discussed in more detail in the Upland RIWP.

Potential sources of contamination at Lady Island include spills or releases from the wastewater treatment system due to equipment failures or weather-related wastewater overflows. There have been two documented spills on Lady Island. The first was a leachate release from the landfill in 1999 due to a large rainfall event, and the second occurred in 2015 when the clarifier overflowed. The volume released, and whether these spills or releases reached the surface water is unknown (Ecology 2021c).

## **2.5 Summary of Previous Investigations**

This section summarizes data from previous investigations as they relate to the Study Area. The discussion is focused on available data that were collected in the Camas Slough, storm drains, or outfalls or within 100 feet of the shoreline. Additional discussion of upland site characterization data (100 feet or more from the shoreline) from previous investigations can be found in the Upland RIWP.

### **2.5.1 Previous Nearshore Soil Investigations**

Previous borings and soil samples were collected from various upland locations, as described in the Upland RIWP (Kennedy Jenks 2023). These nearshore soil investigations are related to suspected petroleum hydrocarbons found in the soil near the Former Cat Shop (SOU-A) and the Fuel Oil Storage area (SOU-C; Figure 2-2). The Upland RI will further investigate the nature and extent of contaminants in soil adjacent to the Camas Slough.

### **2.5.2 Previous Sediment Investigations**

Three studies were performed that included sediment sampling: two studies to support maintenance dredging and one study to monitor potential impacts from permitted NPDES discharges. All sediment data are tabulated in Table B3 of the Upland RI.

#### **2.5.2.1 Dredge Material Characterization**

In 2006, a Dredge Material Management Program sediment quality characterization was conducted to determine whether surface sediment that would remain after proposed maintenance dredging in four areas of the Camas Slough would meet anti-degradation requirements (Figure 2-4). Subsurface sediment samples were collected in each of the four proposed dredge prisms from the mudline

of -1.5 feet mean sea level (MSL) to the proposed dredging elevation of -11.5 feet MSL and 1 foot below the proposed dredging elevation (Z-layer; USACE 2007). In three of the dredged material management units (DMMUs), there were no exceedances of the Regional Sediment Evaluation Team (RSET) Sediment Evaluation Framework contaminants of concern freshwater screening level 1 (SL1) values. Subsurface sediments in the fourth DMMU had a low-level exceedance for zinc (144 milligrams per kilogram [mg/kg]; SL1 = 130 mg/kg) but did not impact material suitability deposition in the designated Dredge Spoils areas on Lady Island.

The Z-layer sediment samples did not exceed the RSET SL1 values in three of the DMMUs. However, subsurface sediment Z-layer samples in the DMMU near the SR-14 overpass showed SL1 exceedances of cadmium, zinc, and PCBs. Additionally, the dioxin concentration for one Z-layer sample was 12.76 nanograms per kilogram (ng/kg) 2,3,7,8-TCDD toxicity equivalence (TEQ).<sup>2</sup>

A 2009 post-dredge characterization survey was conducted to confirm that anti-degradation requirements were met, including within the DMMU near the SR-14 overpass. Nine subsurface sediment samples were collected at three locations within the dredge area at -9 to -10 feet, -11 to -12 feet, and -13 to -14 feet MSL (USACE 2010). Post-dredge surface sediment samples collected from -9 to -10 feet MSL did not exceed SL1 or SL2 RSET values, verifying that dredging operations conformed with protective anti-degradation requirements. However, deeper subsurface sediment samples collected from -15 to -19 feet MSL exceeded freshwater screening levels for cadmium, zinc, and total PCBs.

Polychlorinated dibenzo-*p*-dioxins and dibenzofurans (dioxins), added as a constituent of interest due to the proximity of the Main Mill area to the Camas Slough, were on average less than 1.5 ng/kg 2,3,7,8-TCDD TEQ in the upper 2 feet of the sediment core. This concentration is representative of material that has migrated into the former berth areas from the Columbia River. These concentrations are consistent with other Columbia River background studies that have calculated upper tolerance limit background concentrations of 2 ng/kg 2,3,7,8-TCDD TEQ (Maul Foster Alongi 2011).

### 2.5.2.2 NDPES Permit Monitoring

As part of NPDES Permit No. WA0000256, in 2017 GP characterized surface sediments near Outfalls 001 and 002 and compared concentrations to SMS chemical criteria. Four surface sediment samples were collected near Outfall 001. One sample was collected 500 feet upstream from Outfall 002, and three samples were collected from 100 to 300 feet downstream. Five surface samples were also collected in the vicinity of Outfall 002 at various locations between 200 feet upstream to 100 feet downstream. All of the sediment samples had chemical concentrations below SMS criteria, confirming protectiveness.

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<sup>2</sup> TEQ is the 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) equivalent.

## 2.6 Planned Restoration Activities

GP is in the process of demolishing structures within SOU-A, with the goal of restoring this portion of the property to a more natural configuration. The SOU-A shoreline and nearshore area contains piers, dolphins, and former mill structures and infrastructure. Additional derelict dolphins and piling throughout the slough are included as part of the proposed restoration. To facilitate demolition, GP must dredge the area of the Camas Slough adjacent to the Dock Warehouse (Figure 2-3) to provide equipment access. Permits to gain approval for sediment characterization and the dredging work have been submitted to USACE and are in review.

WDNR requires demolition of these structures to be complete by 2027, and restoration activities will proceed following demolition. The restoration is expected to include regrading of the shoreline to remove hardscape and improve nearshore habitat. The design for the regrading is expected to be completed in 2024 after initiation of sampling proposed in the Upland RIWP.

### 3 Preliminary Conceptual Site Model and Data Gaps

This section presents the preliminary CSM, data gaps identified to finalize the CSM, and DQOs. The preliminary CSM, described in Sections 3.1 through 3.4, is based on information presented in the Upland RIWP and available data collected within the Study Area data discussed in Section 2.5. The preliminary CSM will be refined as additional data are collected during the Sediment RI phases.

#### 3.1 Chemicals of Potential Concern

Preliminary chemicals of potential concern (COPCs) were identified in the Upland RIWP. Table 3-1 summarizes potential sources of contamination in and around the Study Area and related COPCs.

**Table 3-1  
Summary of Potential Sources of Contamination from Upland Areas to Sediment**

Site Operational Unit	Potential Pathway to the Camas Slough	Initial COPCs in Sediment <sup>1</sup>
SOU-A	Historical erosion of nearshore impacted soils or stormwater releases prior to capture and treatment	PCBs, TPH, PAHs, metals
SOU-B	Historical stormwater releases prior to capture and treatment	PCBs, TPH, PFAS, dioxins, PAHs, metals
SOU-C	Historical erosion of nearshore impacted soils or stormwater releases prior to capture and treatment	PCBs, TPH, PFAS, dioxins, PAHs, metals
SOU-D	Historical stormwater releases prior to capture and treatment	PCBs, TPH, PFAS, dioxins, metals

Note:

1. Unless otherwise specified, "metals" includes the following analytes: arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, and zinc.

#### 3.2 Preliminary Screening Levels

Preliminary screening levels for COPCs in sediment are based on the SMS framework described in SCUM (Ecology 2021a). The SMS framework integrates MTCA cleanup requirements. The SMS employs a two-tiered decision-making framework that considers chemical and biological criteria at the sediment cleanup objective (SCO) and cleanup screening level (CSL) to establish sediment cleanup standards.

Preliminary SCO and CSL chemical criteria for this Sediment RIWP are presented in Table A2-4 of the SQAPP. Pulp and paper mills are not an identified source of organotins, less common toxic metals, radioactive substances, and explosive compounds, and thus are not proposed for analysis in this Sediment RI. Organotins are specific to marine antifouling paint that was developed in the 1960s, and no shipyard, dry dock, or marinas have operated in the Study Area. Less common toxic metals

(e.g., beryllium) are typically associated with mining, steel productions, and metal plating operations, none of which have been conducted at or adjacent to the Study Area. No nuclear power activities or medical uses of nuclear compounds have been conducted in the Study Area. Finally, there have been no military installations or munitions loading areas in the Study Area.

Proposed analytes for this sediment RI are summarized in Table A2-4 of the SQAPP.

### **3.3 Nature and Extent of Contamination**

Because existing sediment quality data at the Site are limited, the nature and extent of potential contamination in surface and subsurface sediments will be characterized during the Sediment RI.

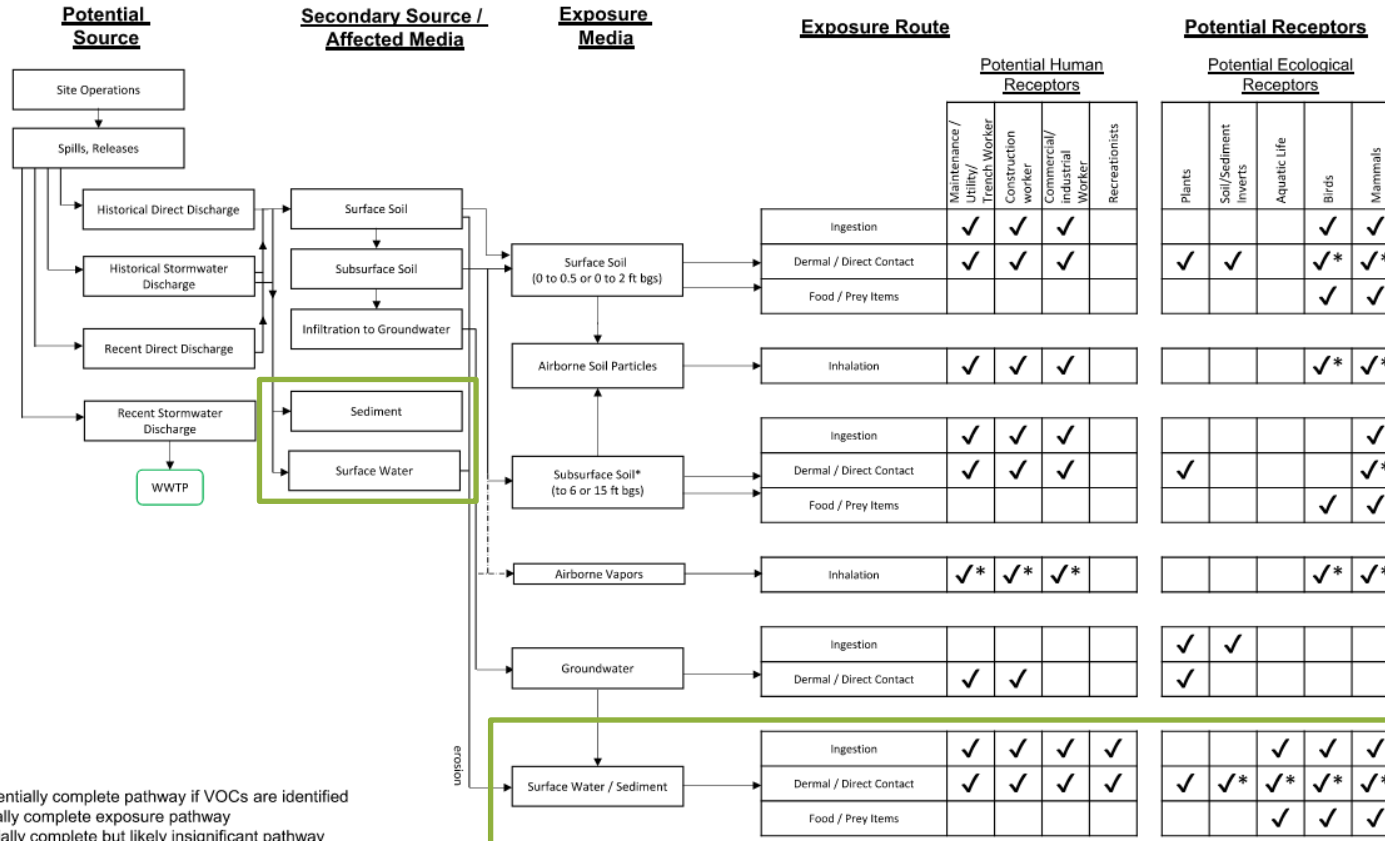
### **3.4 Exposure Pathways**

The Upland RIWP presents an exposure pathway analysis for the entire Site (Graphic 3-1). An exposure pathway describes potential COPC exposures to ecological or human receptors. For an exposure pathway to be considered complete, all the following elements must be present: a COPC release; a COPC transport mechanism; an exposure point; and an exposure route at the exposure point.

Ecological receptors at the Site include benthic organisms and wildlife. Benthic organisms are in direct contact with surface sediment. COPCs can migrate to higher trophic levels via consumption of benthic organisms. Potential higher trophic level receptors, including fish, mammals, and birds, will be considered in the Sediment RI as needed (Graphic 3-1).

Possible human exposure pathways include ingestion of contaminated fish or shellfish or direct contact or incidental ingestion of contaminated sediment via recreational activities, fishing, or clam-digging (Graphic 3-1).

**Graphic 3-1  
Preliminary Sediment Conceptual Site Model**



**Notes:**

- > Potentially complete pathway if VOCs are identified
- ✓ Potentially complete exposure pathway
- ✓\* Potentially complete but likely insignificant pathway

ft bgs = feet below ground surface  
VOC = volatile organic compounds

1. Where depth of groundwater is shallow, exposure depths will be limited to 2 feet below the groundwater table.
2. Stormwater includes overland flow.

Kennedy/Jenks Consultants  
GP Camas Mill  
Camas, Washington

DRAFT

Preliminary Conceptual Site Model

February 2023  
Figure 24

Note: Green boxes denote elements of the overall Site CSM that are the subject of the Sediment RIWP.

### 3.5 Resiliency Considerations

Based on observed climate trends and projections, climate change impacts—including sea level rise, increases in riverine flooding, increased landslide and erosion risk, more intense and frequent wildfires, and more severe drought—may be expected. Consistent with Ecology guidance (Ecology 2017), evaluations of climate change resiliency will be included in the feasibility study, if warranted.

### 3.6 Data Quality Objectives and Data Gaps

Table 3-2 summarizes the three DQOs for the Sediment RI, along with the approach to fill data gaps.

**Table 3-2  
Summary of Data Quality Objectives and Approach to Eliminate Data Gap**

DQO	Data Gap Approach
1. Assess potential impacts from historical discharges to the Camas Slough.	During Phase I, perform sediment grab samples and limited subsurface sediment coring within the Study Area adjacent to historical discharges. Sediment samples will be analyzed for COPCs as required by SMS. During Phase II, as required, perform additional sediment grab samples and subsurface sediment coring within the Study Area. Expand investigation beyond the Study Area, as required, to finalize CSM and evaluate background.
2. Assess potential impacts to the Camas Slough and Columbia River from past log storage activities.	During reconnaissance, perform field studies, including acoustic surveys and remote underwater photography. During Phase I, perform sediment grab samples to assess the presence of wood debris in surface sediments. Collect limited bioassay samples to assess potential impacts related to areas with accumulated wood debris. During Phase II, as required, perform subsurface sediment cores and bioassay testing to finalize CSM. Collect surface water sampling to assess potential impacts related to areas with accumulated wood debris.
3. Assess potential impacts from permitted WWTP discharge to the Columbia River.	NPDES permit-required sediment sampling has sufficiently characterized sediment quality in the WWTP outfall area. No sampling is proposed in Phase I.

Data gaps associated with DQOs 1 and 2 are targeted for the Phase I Sediment RI sampling activities described in Section 4 and in the SQAPP. Data collected as part of the Phase I sediment investigation may identify additional data gaps. For example, if surface sediment toxicity from wood debris accumulations is identified in the Study Area during Phase I, related data gaps could include refinement of the extent of SMS biological toxicity and water quality assessments. As required, DQOs will be revised based on the results of the Sediment Phase I and Upland RI investigations. The phased approach to the RI will build upon the current understanding of the CSM. As additional information becomes available, the CSM and data gaps will be re-evaluated, and additional planning will occur following adaptive management. Phase II will address data gaps identified following Phase I of the RI.



## 4 Remedial Investigation Tasks

Consistent with SMS and MTCA requirements, the Sediment RI will collect, develop, and evaluate sufficient data for Ecology to establish cleanup standards and select a cleanup action. The proposed field investigation will supplement available historical data by addressing data gaps described in Section 3.6. The field investigation will be conducted with a phased approach that uses data collected in the reconnaissance phase and Phase I to inform data collection in Phase II, as described in the following sections.

### 4.1 Field Investigation Overview

A phased field investigation approach will be performed: reconnaissance, Phase I, and Phase II data collection.

#### 4.1.1 Reconnaissance

The reconnaissance phase of the project will be conducted to supplement existing information regarding the physical conditions within the Study Area. This phase will include the following field surveys:

- Bathymetric surveying with side-scan sonar methods to map the water depths within the Camas Slough and in the Washougal and Columbia Rivers around Lady Island and to identify potential locations of accumulated logs and wood debris
- Remote underwater videography to observe the river bottom in locations where log storage previously occurred within the Camas Slough and around Lady Island
- Drone photography of the shoreline to facilitate visual inspection of shorelines that are inaccessible by upland or water

Data collected during the reconnaissance phase will be used to further inform and refine, as appropriate, Phase I sampling plan development.

#### 4.1.2 Phase I Sampling

Surface sediment sampling will be conducted to characterize surface and subsurface sediment in the Study Area. The sampling design will be focused around areas where there are potential COPC migration pathways and will also include randomized sampling throughout the Study Area. Surface sediment grabs will also target areas of potential wood debris accumulation identified by the reconnaissance survey.

Subsurface sediment cores will be collected to evaluate the potential depth of sediments exceeding SMS screening criteria. As described in the SQAPP (Appendix A), select intervals will be subject to primary analyses, and the rest will be archived and analyzed as needed based on the results of the primary analyses.

Figure 4-1 provides the locations of sampling associated with DQO 2; Figure 4-2 provides locations of samples to address DQO 1.

### *4.1.3 Phase II Sampling*

The Phase II sampling design will be developed in coordination with Ecology based on the results of the Upland RI sampling, Phase I sediment sampling, and updated in-water CSM. Phase II sampling may include supplemental surface and subsurface sediment sampling in locations within and beyond the current Study Area, bioassay evaluations, porewater, and surface water collection.

## **4.2 Data Management and Analysis**

Data collected for this project will be validated and managed consistent with the SQAPP. The data management system will be compatible with Ecology's Environmental Information Management data management system and support the development of the RI and, if required, a feasibility study.

## 5 Schedule

Project deliverables and target dates for completion are shown in the following bullet list. This schedule is subject to change depending on the timeline for Ecology review and approval of this Sediment RIWP and future deliverables:

- Sediment RIWP approval: spring 2024
- Sediment RI Phase I implementation: summer through fall 2024
- Meet with Ecology to discuss Upland RI results and Phase I sediment results and develop scope of Phase II sediment investigation: winter 2024
- Sediment RI Phase II implementation: spring through fall 2025
- Draft Sediment RI report submittal: spring 2026

The need for these potential additional steps (e.g., feasibility studies) will be evaluated with Ecology after completion of the RI.

## 6 References

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USACE (U.S. Army Corps of Engineers), 2007. *DMMP Determination on the Sediment Quality of the Exposed Sediment Surface after Dredging to Verify Compliance with the Washington State Antidegradation Policy of the Camas Slough Camas, Washington Maintenance Dredge Project*. 2003-01135. August 2, 2007.

USACE, 2010. *DMMP Determination on the Sediment Quality of the Exposed Sediment Surface after Dredging to Verify Compliance with the Washington State Antidegradation Policy of the Camas Slough Camas, Washington Maintenance Dredge Project*. 2003-01135. March 10, 2010.


## Figures

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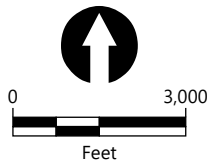


**LEGEND:**

 Camas Mill Property Boundary

**NOTES:**

- 1. Aerial imagery: Esri (2023)
- 2. Base map: Esri World Street Map



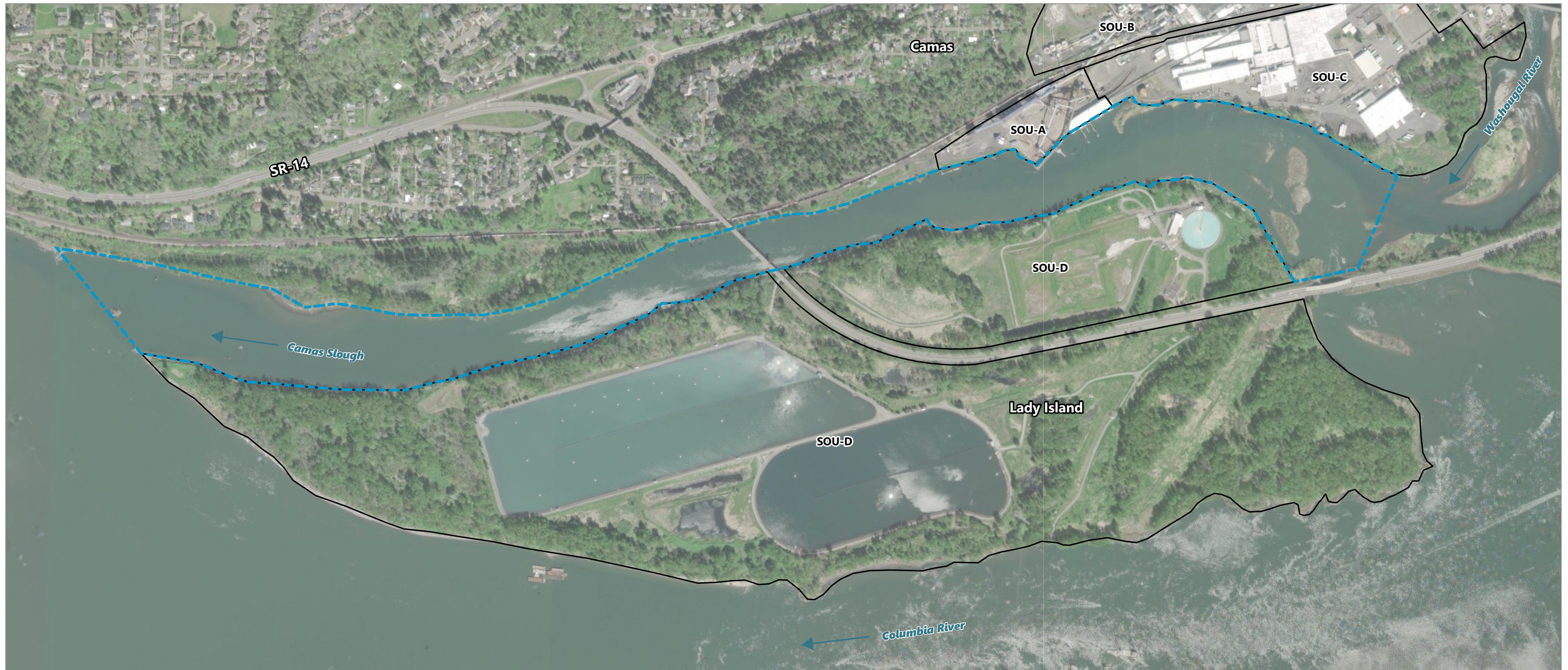
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**Figure 1-1  
Project Vicinity**

Camas Mill Sediment Remedial Investigation Work Plan  
Georgia-Pacific LLC



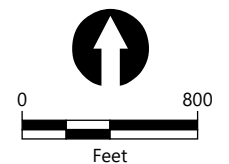


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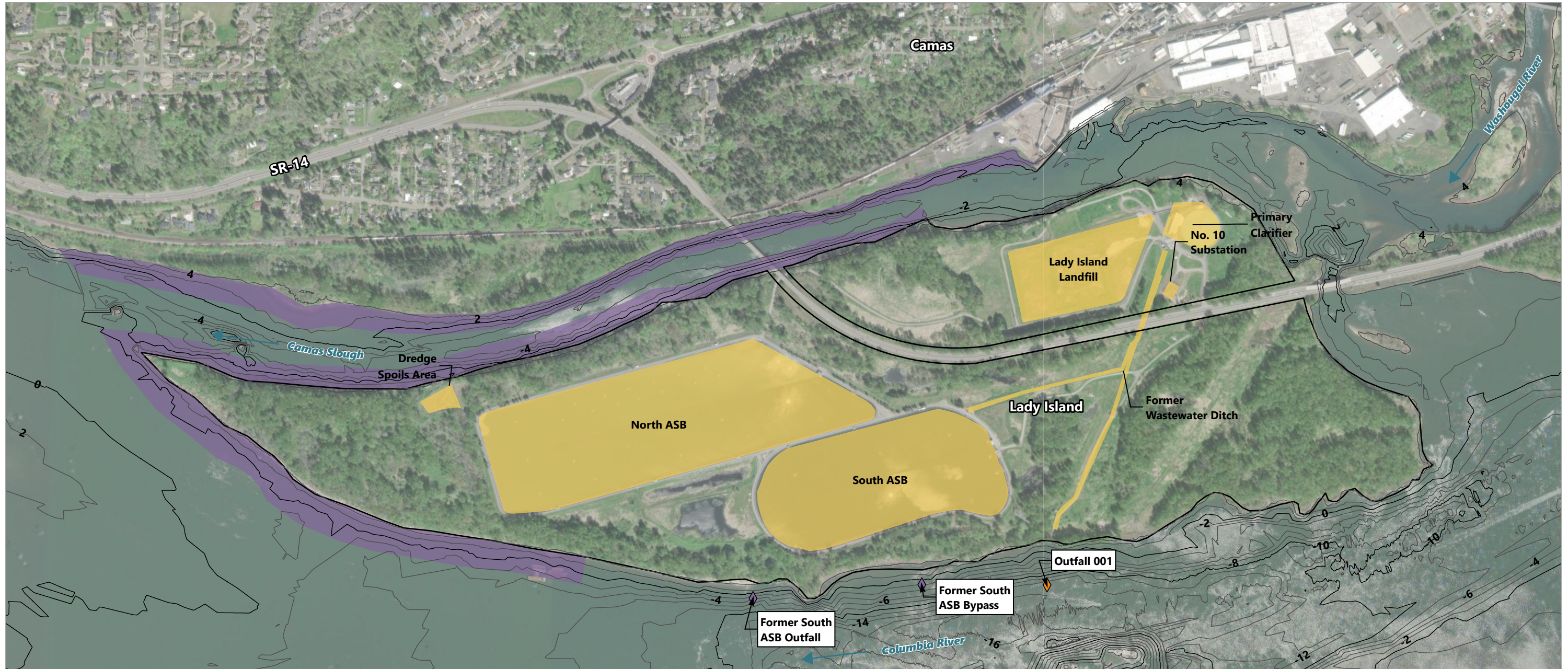
-  Site Operational Unit
-  Camas Slough Study Area

**NOTE:**

1. Aerial imagery: Esri (2023)
2. Site Operational Units (SOU) are described in the Upland RIWP (Kennedy Jenks 2023).
  - SOU-A: Woodyard
  - SOU-B: Main Mill Area - North
  - SOU-C: Main Mill Area - South
  - SOU-D: Lady IslandRefer to Upland RIWP for information about SOU-E and SOU-F.

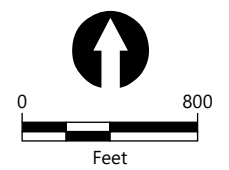






- LEGEND:**
- Operational Unit
  - Operational Feature
  - Approximate Limits of Former Log Storage Area
  - 2-foot Contour (NAVD88)
  - 10-foot Contour (NAVD88)
  - ◆ Active Outfall
  - ◆ Former Outfall

- NOTES:**
1. Aerial imagery: Esri (2023)
  2. Contours (NAVD88): Estuary Partnership (2010)

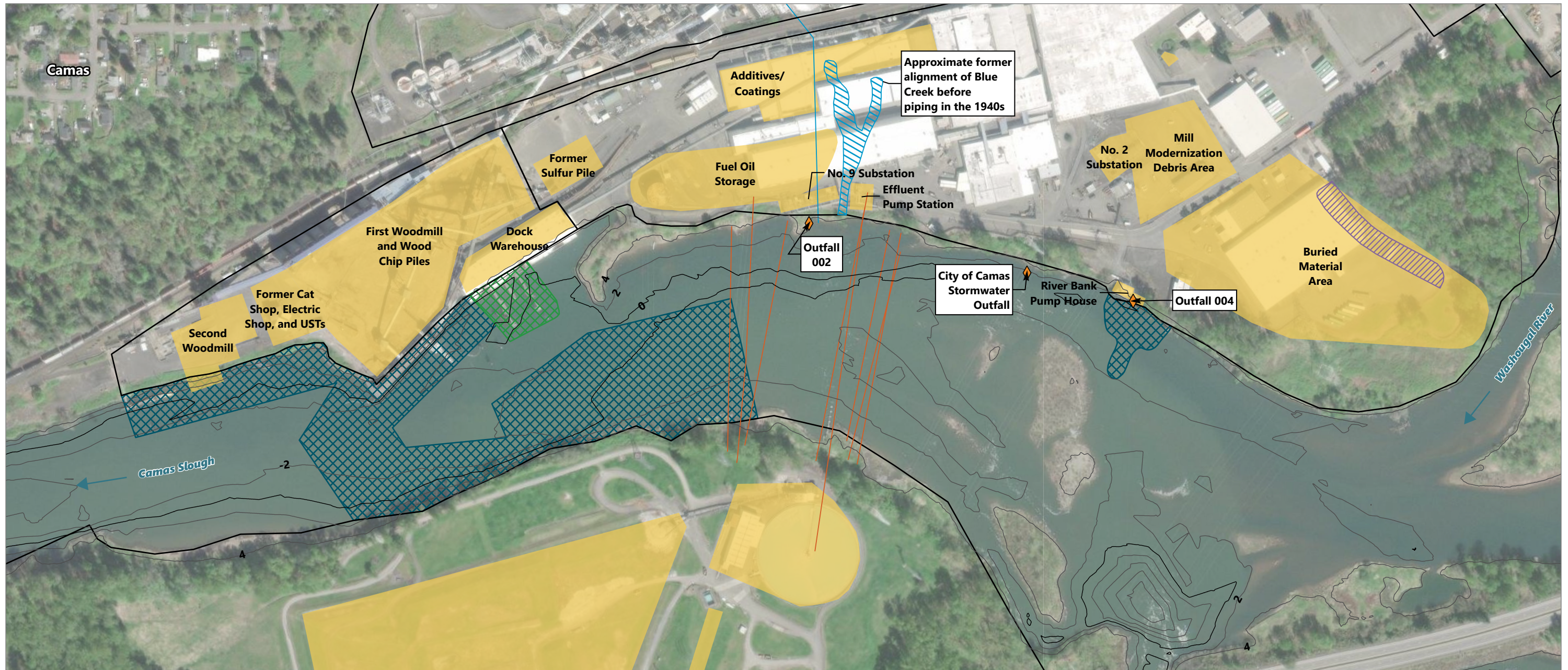


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**Figure 2-2**  
**Overview of Conditions Around Lady Island**  
 Camas Mill Sediment Remedial Investigation Work Plan  
 Georgia-Pacific LLC



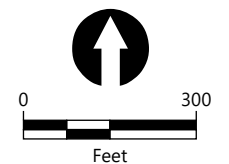
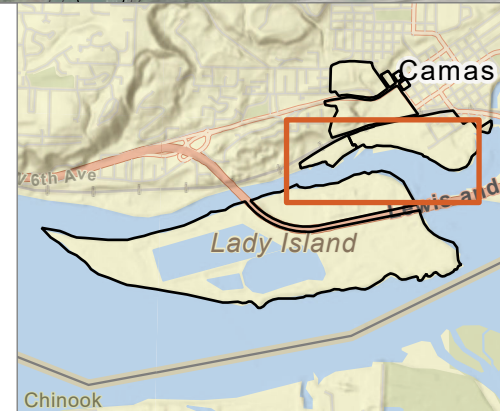


**LEGEND:**

- |   |                          |
|---|--------------------------|
| Operational Unit  | 2-foot Contour (NAVD88)  |
| Operational Feature   | 10-foot Contour (NAVD88) |
| Approximate Maintenance Dredging Area                           | Utility Crossing         |
| Approximate Limits of Planned Dredging to Facilitate Demolition | Blue Creek               |
| Approximate Extent of Closed Inert Solid Waste Landfill         | Active Outfall           |
|   | Former Outfall           |

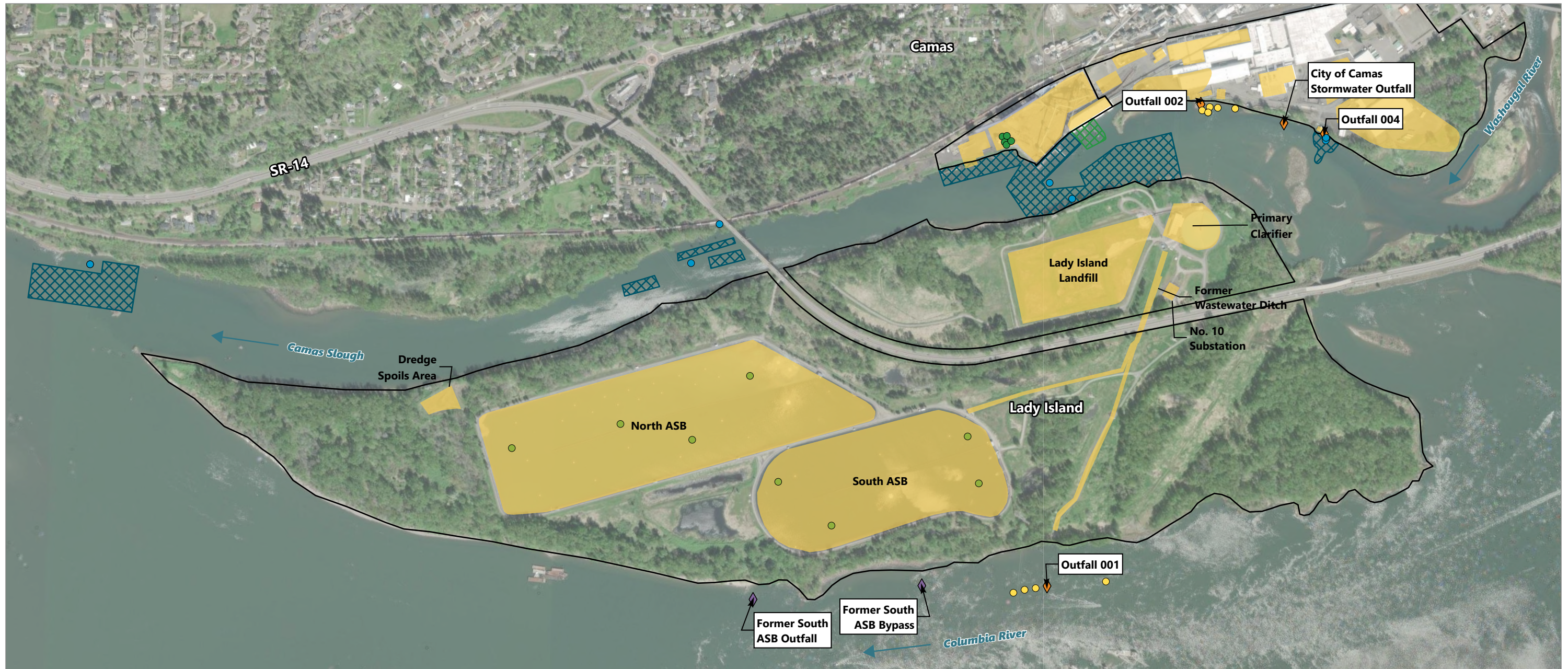
**NOTES:**

1. Aerial imagery: Esri (2023)
2. Contours (NAVD88): Estuary Partnership (2010)
3. Utility crossings include acid sewer, water, communication cable, process sewer, electrical, and fire main.



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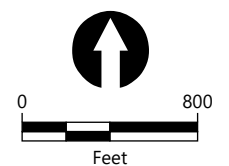
**LEGEND:**

- Operational Unit
- Operational Feature
- Approximate Maintenance Dredging Area
- Approximate Limits of Planned Dredging to Facilitate Demolition
- ◆ Active Outfall
- ◆ Former Outfall

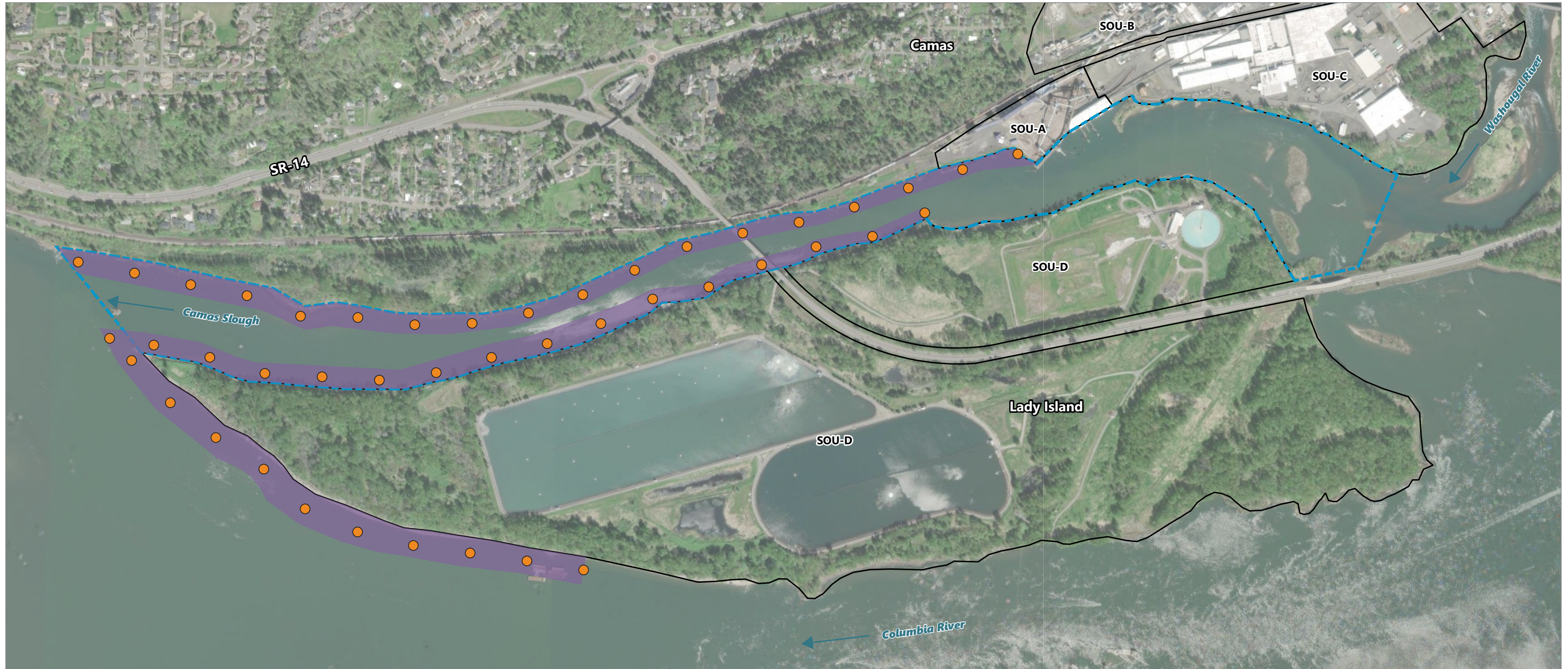
- ASB Sampling Location
- Surface and Subsurface Sediment Investigation**
- 2007-2009 Dredged Material Management Program Study by Ecology (Locations are approximate)
- Surface and Subsurface Soil Investigation**
- 2016 Investigation by GP in response to documented record of spills in the former cat shop, electric shop, and USTs area

- Surface Sediment Investigation**
- 2017 Outfall monitoring in the vicinity of Outfall 001 and Outfall 002 for NPDES Permit No. WA0000256.

**NOTE:**  
1. Aerial imagery: Esri (2023)

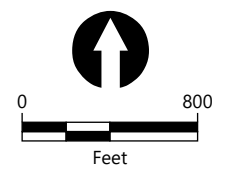






- LEGEND:**
- Site Operational Unit
  - ▭ Camas Slough Study Area
  - Approximate Limits of Former Log Storage Area
  - Wood Debris Grab Sample Location

**NOTE:**  
1. Aerial imagery: Esri (2023)

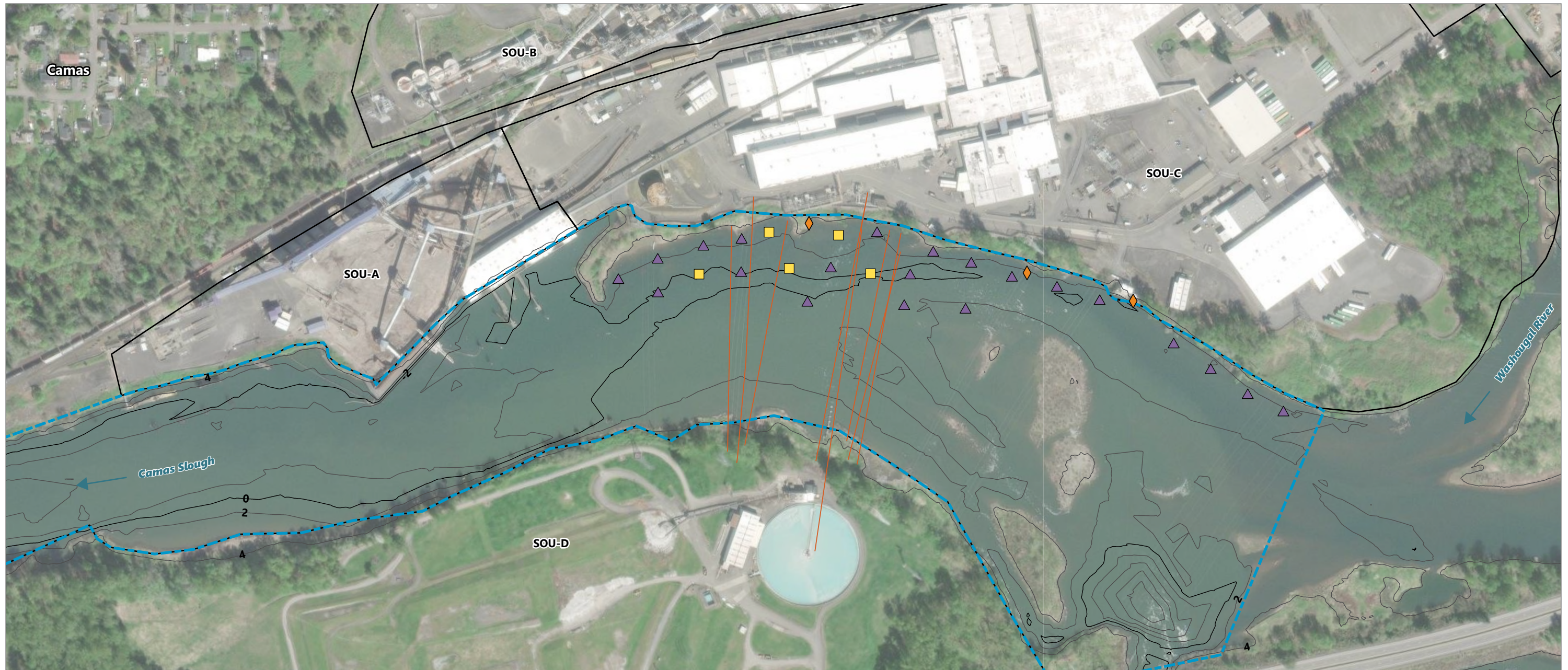


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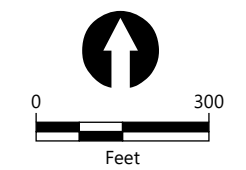
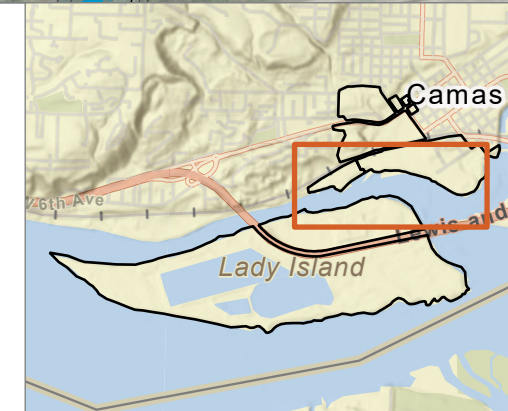
**Figure 4-1**  
**Log Storage Areas and Proposed Wood Debris Sampling Location**  
Camas Mill Sediment Remedial Investigation Work Plan  
Georgia-Pacific LLC





- LEGEND:**
- Site Operational Unit
  - ▭ Camas Slough Study Area
  - 2-foot Contour (NAVD88)
  - 10-foot Contour (NAVD88)
  - Utility Crossing
  - ◆ Active Outfall
  - ▲ Sediment Grab Sample Location
  - Sediment Grab Sample and Subsurface Core Location

**NOTE:**  
1. Aerial imagery: Esri (2023)



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**Figure 4-2**  
**Phase I Proposed Sediment Sampling Locations**  
Camas Mill Sediment Remedial Investigation Work Plan  
Georgia-Pacific LLC



Appendix A  
Sediment Sampling and Quality Assurance  
Project Plan

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DRAFT

November 2023  
Camas Mill Sediment Remedial Investigation



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# Sediment Sampling and Quality Assurance Project Plan

Prepared for Georgia-Pacific LLC



DRAFT

November 2023  
Camas Mill Sediment Remedial Investigation

# Sediment Sampling and Quality Assurance Project Plan

**Prepared for**  
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**Prepared by**  
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**ATTACHMENTS**

Attachment A1	Sediment PFAS Sampling Guidance
Attachment A2	Field Forms

## ABBREVIATIONS

cm	centimeter
CRD	Columbia River Datum
CSL	cleanup screening level
DGPS	differential global positioning system
DQO	data quality objective
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ETFE	ethylene fluoroethylene
FC	Field Coordinator
FEP	perfluorinated ethylene-propylene
GC/MS	gas chromatograph/mass spectrometer
HDPE	high-density polyethylene
LC-MS/MS	liquid chromatography – mass spectrometry
LCS	laboratory control sample
LDPE	low-density polyethylene
MD	matrix duplicate
MS	matrix spike
MSD	matrix spike duplicate
MTCA	Model Toxics Control Act
NAD83	North American Datum of 1983
OPR	ongoing precision and recovery
PAH	polycyclic aromatic hydrocarbon
PFAS	perfluoroalkyl and polyfluoroalkyl substances
PVDF	polyvinylidene fluoride
QA	quality assurance
QC	quality control
RI	remedial investigation
RPA	Registered Professional Archaeologist
RPD	relative percent difference
SCUM	Sediment Cleanup User's Manual
Sediment RIWP	<i>Sediment Remedial Investigation Work Plan</i>
Site	Camas Mill Site
SMS	Sediment Management Standards
SQAPP	<i>Sediment Sampling and Quality Assurance Project Plan</i>
Study Area	the portion of the Camas Slough adjacent to the Camas Mill operations
Teflon	polytetrafluoroethylene
WAC	Washington Administrative Code

# 1 Introduction

This *Sediment Sampling and Quality Assurance Project Plan* (SQAPP) describes the survey and sample collection methods, analytical protocols, and quality assurance objectives and requirements for the in-water portion of Camas Mill remedial investigation (RI). This SQAPP has been prepared in accordance with the Sediment Management Standards (SMS; Chapter 173-204 Washington Administrative Code [WAC]) and the Model Toxics Control Act (MTCA; Chapter 173-340 WAC). The Camas Mill Site (Site) is identified as Facility Site ID No. 66765272 and Cleanup Site ID No. 15156 in the Washington State Department of Ecology (Ecology) cleanup sites catalog.

## 1.1 Objective

This SQAPP, which is Appendix A of the *Sediment Remedial Investigation Work Plan* (Sediment RIWP), describes the methods and processes that will be used to collect data in support of the objectives laid out in the Sediment RIWP. The purpose of the investigation is to collect, develop, and evaluate sufficient information to adequately characterize the portion of the Camas Slough adjacent to the Camas Mill operations (Study Area) for the purpose of developing a final conceptual site model. The extents of the in-water Study Area will be refined as the phases of the RI progress. This SQAPP includes information regarding Phase I investigation activities. The SQAPP will be revised after the scope of the Phase II investigation is determined, in consultation with Ecology. Background and additional objective information can be found in the Sediment RIWP.

## 1.2 Document Organization

This SQAPP is organized as follows:

- **Section 2** provides a description of the sampling design and sampling and analysis methods.
- **Section 3** includes quality assurance (QA)/quality control (QC) procedures for the field collection and laboratory testing of samples.
- **Section 4** summarizes documentation, recordkeeping, and reporting requirements.
- **Section 5** describes data validation procedures to ensure that data are of acceptable quality for use.
- **Section 6** lists references cited in this SQAPP.

## 2 Data Generation and Acquisition

The section describes the type, quality, and quantity of data needed for the investigation.

### 2.1 Field Surveys

Field surveys include bathymetric surveys and shoreline visual inspections.

#### 2.1.1 *Bathymetric and Side-Scan Sonar Surveys*

Bathymetric and side-scan sonar surveys will be performed using multibeam bathymetry equipment. A licensed surveyor will perform and review all hydrographic survey work. This work will include surveying site-wide submerged areas to develop a map of water depth within Camas Slough and around Lady Island (Sediment RIWP Figure 2-2). The side-scan sonar will provide imaging detail that will be used to identify areas of wood debris adjacent to SOU-C and where log storage activities historically occurred.

#### 2.1.2 *Remote Underwater Video*

Based on the review of the side-scan sonar survey results, remote underwater videos will be taken in areas where wood debris is expected to occur in order to observe the condition of the riverbed. As appropriate, the videos also will be used to refine the locations of grab samples that will be collected to determine the percent coverage and thickness of wood debris on the riverbed.

#### 2.1.3 *Shoreline Visual Surveys*

The shoreline bank condition surveys will be conducted to document the condition and composition of the shoreline in the Study Area adjacent to SOU-A and SOU-C. Surveys will be conducted by inspecting and photographing shoreline areas and recording major components, structures, erosional areas, and topography. Drone surveys will also be conducted to assist in inspecting areas from overhead and offshore areas, and areas that are difficult to reach by foot.

The following information will be recorded:

- Horizontal and vertical extent of armored (i.e., riprap, vegetated, or large woody debris) and unarmored (i.e., exposed bank soil) areas from the toe of slope to the top of bank
- Locations of any structures, including piers and bulkheads
- Locations of outfalls and other utilities
- Armor rock size, bank slope, visual assessment of thickness (where possible), and condition of armor rock in all rock-armored areas
- Vegetation/large wood debris type, bank slope, and condition (e.g., health/density, anchoring) in areas armored with vegetation or large wood debris

- Visual inspection and identification of areas where armored slopes appear to be damaged or failing

## 2.2 Sediment Sample Collection

This section describes the methodology for positioning, sample collection, processing, identification, documentation, equipment decontamination, and handling of investigation-derived waste for the field investigation.

### 2.2.1 *Sampling Vessels and Field Equipment*

Appropriately outfitted sampling vessels will be used to collect both surface and subsurface sediment samples. Surface sediment will be collected from the sampling vessel using a modified pneumatic or hydraulic Van Veen grab sampler (i.e., power grab). Subsurface sediment will be collected using a vibracore onboard a vessel equipped with an A-frame and sufficient deck space for staging of gear and sample processing.

### 2.2.2 *Surface Sediment Sampling*

Surface sediment grab samples will be collected from the locations shown in Figures A2-1 and A2-2 and listed in Table A2-1.

#### 2.2.2.1 **Grab Sample Collection Procedures**

Surface sediment grab samples from the 0- to 10-centimeter (cm) biologically active zone will be collected for wood debris observations, chemical analyses, and contingent bioassays using a Van Veen-type pneumatic power grab sampler from 44 wood debris observation locations and 26 locations for chemistry analyses. The target locations are shown in Figures A2-1 and A2-2, and coordinates for each station are listed in Table A2-1. The steps for surface sediment grab sample collection are summarized as follows:

- Maneuver the vessel to the proposed location.
- Decontaminate the grab sampler.
- Deploy the sampler to the sediment surface.
- Draw the winch cable taut and vertical.
- Record coordinates of the cable hoist.
- Close the grab sampler to collect the sample.
- Retrieve the sampler aboard the vessel.
- Grab sample acceptability criteria are as follows:
  - The grab sampler is not overfilled (i.e., sediment surface is not against the top of the sampler).
  - Sediment surface is relatively flat, indicating minimal disturbance or winnowing.
  - Overlying water is present, indicating minimal leakage.

- Overlying water has low turbidity, indicating minimal sample disturbance.
- A desired penetration depth of at least 10 cm is achieved.

If an acceptable surface sediment sample cannot be collected, the vessel will be moved up to 50 feet and additional attempts made. If an acceptable sample is not collected after three attempts at a given location, modified sample acceptance criteria (i.e., shallower depth of recovery after multiple attempts) may be used and a sample may be collected. The best of three attempts will be the final sample collected. All acceptable sediment samples that meet the collection criteria will be processed as described in the following section.

**2.2.2.2 Processing Procedures for Grab Samples collected for Wood Debris Observations**

Sediment grabs collected for the purpose of determining the presence of wood debris deposits exposed at the riverbed surface will be processed aboard the sampling vessel. Prior to processing, the grab will be photographed in color, and a sediment description will be recorded on a grab collection form. The following parameters will be recorded if present and as applicable:

- Sample recovery depth in cm
- Physical soil description of the grab in accordance with the Unified Soil Classification System (soil type, density/consistency, moisture, color)
- Odor (e.g., hydrogen sulfide, petroleum)
- Vegetation
- Debris
- Biological activity (e.g., detritus, shells, tubes, bioturbation, or live or dead organisms)
- Oil sheen and type (e.g., metallic, rainbow)
- Any other distinguishing characteristics or features

After these parameters are recorded, the samples will be sieved, and the following qualitative metrics will be determined from the field observations:

Metric	Notes
Presence and amount of wood debris	Visual estimate of approximate wood debris amount and percent cover: <ul style="list-style-type: none"> <li>• None = none</li> <li>• Trace = less than 5%</li> <li>• Low = 5% to 20%</li> <li>• Medium = 20% to 50%</li> <li>• High = greater than 50%</li> </ul>

The grab samples collected for wood debris observations will be analyzed for parameters listed in Table A2-1. Samples will be collected per the procedures in Section 2.2.2.3. Per Section 2.2.2.4,



additional sediment grabs will be collected for bioassay testing from up to five locations with greater than 25% wood debris.

### 2.2.2.3 Processing Procedures for Grab Samples collected for Analytical Testing

Sediment grab processing will be conducted aboard the sampling vessel. All working surfaces and instruments will be thoroughly cleaned, decontaminated, and covered with aluminum foil to minimize outside contamination between sampling stations. Disposable gloves will be discarded after processing each station and replaced prior to handling decontaminated instruments or work surfaces. The steps for processing samples are as follows:

- Place the grab on a stable surface. Remove any overlying water using a syphon hose and/or turkey baster. Following grab acceptance criteria listed in Section 2.2.2.1, determine whether the grab is acceptable.
- After noting their presence, remove any large objects or debris from the sediment surface.
- Because sulfides are volatile and can be lost during sample processing and homogenization, the aliquot for sulfide analysis will be collected prior to processing of the remaining grab sample. A representative amount of sediment from the required depth will be collected, placed in the sample jar, preserved, and capped without headspace.
- Prior to processing, the grab will be photographed in color, and a sediment description will be recorded on a grab collection form. The following parameters will be recorded if present and as applicable:
  - Sample recovery depth in cm
  - Physical soil description of the grab in accordance with the Unified Soil Classification System (soil type, density/consistency, moisture, color)
  - Odor (e.g., hydrogen sulfide, petroleum)
  - Vegetation
  - Debris
  - Biological activity (e.g., detritus, shells, tubes, bioturbation, or live or dead organisms)
  - Oil sheen and type (e.g., metallic, rainbow)
  - Any other distinguishing characteristics or features
- Using a clean, stainless-steel spoon, sample material from the desired grab depth (0 to 10 cm) will be collected into a clean, stainless-steel bowl or high-density polyethylene (HDPE) bucket. To avoid cross-contamination, care will be taken to collect only sediment that has not come into contact with the sides or bottom of the grab sampler. When sufficient material has been collected, the sample will be homogenized until a uniform color and consistency is achieved.
- Sample containers (Table A2-2) will be labeled and filled, and containers capped.
- Containers will be checked for accurate identification, analysis, and lid tightness.
- Containers will be packed to prevent breakage and placed inside a cooler with ice for storage at the proper temperature (less than 6°C for all samples).

#### 2.2.2.4 Surface Sediment for Bioassay Samples

Bioassay samples will be collected at up to five wood debris evaluation grab sample locations where 25% or greater wood debris is observed in the field sample. Additional bioassay sampling may be included in Phase II of the Sediment RI based on the results of analytical testing. Surface sediment will also be collected for potential bioassay analyses to assess benthic toxicity if surface sediment chemical concentrations at these locations exceed the cleanup screening level (CSL) for freshwater sediment as provided in Table 8-1 of the Sediment Cleanup User's Manual (SCUM; Ecology 2021). Sediment will be collected from each location for potential bioassay analyses. Additional grabs may be collected as necessary to achieve the required volume for all analyses. If needed, all sediment collected from multiple grabs at one location will be homogenized prior to aliquoting for chemical and bioassay analyses, following the same surface grab sampling and processing techniques discussed in Sections 2.2.2 and 2.2.4. All bioassay samples will be held in refrigerated storage until chemical results are available and screened against the CSL.

If any chemical results exceed CSL values, bioassay analyses will be triggered. Bioassays will not be conducted on samples that do not exceed CSL values, and the material will be disposed of properly and accordingly.

The following sediment toxicity tests will be performed for all triggered bioassay samples:

- 28-day freshwater amphipod (*Hyalella azteca*) survival endpoint
- 28-day freshwater amphipod growth endpoint
- 10-day freshwater midge (*Chironomus dilutes*) survival endpoint

Bioassay data will be evaluated as shown in Table A2-3. The negative control from the tests will be used in interpreting toxicity responses in the sediment samples collected within the Remedial Area. The responses of the organisms exposed to Remedial Area sediments will be statistically compared to the responses of the organisms in negative control tests. Bioassay data will be interpreted using the freshwater biological criteria presented in Table 8-4 of SCUM (Ecology 2021).

### 2.2.3 Subsurface Sediment Core Collection

Sediment cores will be collected from the locations shown in Figure A2-2 and listed in Table A2-1.

#### 2.2.3.1 Core Collection Procedures

Subsurface sediment samples will be collected using a vibracore sampler. Proposed sampling location coordinates are provided in Table A2-1, and sample locations will be located using a differential global positioning system (DGPS). Prior to collecting each core, the depth to mudline will be determined using a calibrated fathometer or lead line.

Subsurface sediment will be collected in rigid external tubes with either polycarbonate liners or dedicated aluminum core tubes with a core catcher attached to the bottom end. Core tubes will be decontaminated prior to use following the protocols outlined in Section 2.2.10.

The vibracore will be deployed from the bow of the vessel using an A-frame and winch assembly. A decontaminated tube will be clamped to the vibracore, and once in position, the vibracore unit will be deployed, energized, and driven to its maximum length or to refusal. Once the required penetration depth is achieved or refusal occurs, the vibracore will be turned off and returned to the surface for evaluation. The location will be recorded using a DGPS for future reference. Upon core retrieval, the following information will be recorded:

- Date and time of collection
- Depth to mudline
- Total drive length
- Recovered length
- Condition of core surface (whether overlying water is present and the core surface is intact)
- Preliminary assessment of sediment characteristics contained in the core catcher at the bottom of the tube

To determine if a core is suitable for processing, the following acceptability criteria will be used:

- The core penetrated to the target.
  - If refusal is reached before project depth, additional cores will be attempted within a 20-foot radius of the original position. If an acceptable core is not collected after three attempts, the core that best meets acceptance criteria of the three cores will be accepted for processing.
- Recovery was at least 75% of the length of core penetration.
  - If recovery of 75% is not achieved after three attempts, the core that best meets acceptance criteria and project requirements will be accepted for processing.
- Cored material did not extend out of the top of the core tube or contact any part of the sampling apparatus at the top of the core tube.
- There were no obstructions noted in the core catcher that might have blocked the subsequent entry of sediment into the core tube and resulted in incomplete core collection.

Cores may be processed on the vessel or a processing barge or transported to an upland processing facility. If transporting, the core tubes may be divided into smaller sections to facilitate upright storage and transport to the processing location. Cut tubes will be individually labeled and sealed with core caps taped with duct tape to prevent material loss during transport. Core orientation will also be noted on each tube. Labels identifying the core section will be securely attached to the

outside of the tube using tape and waterproof ink or by scribing the information into the core tube. The cores or core sections will be stored upright and on ice until processing.

### 2.2.3.2 Core Logging and Processing Procedures

The core processing station will either be located on the sampling vessel, sample processing barge, or upland processing area. Cores will be handled consistent with ASTM International procedure D4220 and stored upright on site until processed. Filled sample containers will be stored in coolers containing ice to maintain the samples at  $4^{\circ}\text{C}\pm 2^{\circ}\text{C}$  until delivery or shipping to the analytical laboratory.

All working surfaces and instruments will be thoroughly cleaned, decontaminated, and covered with aluminum foil to minimize cross-contamination between sample processing. Disposable gloves will be discarded after processing each station and replaced prior to handling decontaminated instruments or work surfaces.

The steps for processing the samples are listed as follows:

1. Cut core longitudinally using a circular saw or power shears, taking care not to penetrate the sediment while cutting. Alternatively, cores may be cut to remove approximately one-third of the core tube.
2. Use decontaminated utensils to split the core to expose the center of the two halves for sampling, or lift the smaller cut core tube section from the top of the core to expose the sediments. If the core is not divided in half, scrape the outer edge of the core material using decontaminated utensils from the bottom to the top to remove any material that migrated during collection.
3. Photograph the entire length of the core, including identification information and a tape measure to record the length.
4. Record the description of the core sample on the core log form for the following parameters as appropriate and present:
  - a. Sample recovery (depth in feet of penetration and sample compaction)
  - b. Physical soil description in accordance with the Unified Soil Classification System (includes soil type, density/consistency of soil, and color)
  - c. Odor (e.g., hydrogen sulfide or petroleum)
  - d. Vegetation
  - e. Debris
  - f. Biological activity (e.g., detritus, shells, tubes, bioturbation, or live or dead organisms)
  - g. Visual stratification, structure, and texture
  - h. Presence of oil sheen
  - i. Any other distinguishing characteristics or features

5. The core will be sectioned into 0.5-foot intervals and analyzed for the parameters listed in Tables A2-1 and A2-4. If the bottom interval is less than 6 inches, it will be combined with the interval above it. All unanalyzed intervals will be archived.
  - a. Using a clean spoon, sediment from each core interval will be placed into a cleaned, stainless-steel bowl, homogenized by hand, placed into containers described in Table A2-2, and either submitted for analysis or archived for potential future analyses.
6. Immediately after filling the sample container with sediment, place the screw cap on the sample container and tighten.
7. Thoroughly check all sample containers for proper identification, analysis type, and lid tightness.
8. Pack each container carefully to prevent breakage and place inside of a cooler with ice for storage at the proper temperature ( $4^{\circ}\pm 2^{\circ}\text{C}$  for all samples).

#### *2.2.4 Sampling Schedule and Platform*

Sampling will occur after approval of this SQAPP by Ecology and is anticipated to occur in summer 2024. Mobilization, field sampling, sample processing, and demobilization will occur over approximately 10 days.

Collection of subsurface sediment cores and surface sediment grab samples will be conducted by a qualified contractor and overseen by Anchor QEA, LLC. All collection will be completed from a vessel properly equipped with the appropriate navigation and sample collection equipment. The vessel will be operated by a licensed captain and will conform to U.S. Coast Guard regulations.

#### *2.2.5 Horizontal Positioning and Vertical Control*

Horizontal positioning will be determined using differential GPS based on target coordinates shown in Table A2-1. The horizontal datum will be North American Datum of 1983 (NAD83), Washington State Plane, South Zone. Measured station positions will be converted to latitudinal and longitudinal NAD83 coordinates to the nearest 0.01 second. The accuracy of measured and recorded horizontal coordinates is typically less than 1 meter and will be within  $\pm 3$  meters following Ecology guidance. All vertical geographical coordinates will be relative to Columbia River Datum (CRD).

Mudline elevations of each sediment sampling location will be determined relative to CRD by measuring the water depth of a calibrated fathometer or lead line and subtracting the water elevation. River elevations will be determined using a National Oceanic and Atmospheric Administration River gauge or the nearby U.S. Army Corps of Engineers staff gauge in CRD.

#### *2.2.6 Equipment Decontamination Procedures*

Sample containers, instruments, working surfaces, technician protective gear, and other items that may come into contact with sediment sample material must meet high standards of cleanliness. All equipment and instruments used that are in direct contact with the sediment collected for analysis

must be made of glass, stainless-steel, or HDPE, and will be cleaned prior to each day's use and between individual sample processing. Decontamination of all items will follow Puget Sound Estuary Program protocols. The decontamination procedure is as follows:

- Scrub until free of visible sediment and rinse with site or tap water.
- Wash with solution of tap water and Alconox soap (brush).
- Rinse with tap water.
- Rinse thoroughly with distilled water.
- Cover (no contact) all decontaminated items with aluminum foil if not used immediately after decontamination.

### *2.2.7 Sample Containers for Analyses*

The contract laboratory will provide certified, pre-cleaned, U.S. Environmental Protection Agency (EPA)-approved containers for all chemistry samples. Sediment for bioassay testing will be placed in clean food-grade polyethylene bags and sealed without headspace and airtight. Bags will be placed in a second bag to further protect and contain the material. Samples for perfluoroalkyl and polyfluoroalkyl substance (PFAS) analyses will be collected in HDPE containers without Teflon-lined lids and should be kept separate from other sample containers. Table A2-2 lists container size, holding times, and preservation for the categories of analytes. At a minimum, each sample container will be labeled with the following information:

- Project name and number
- Sample identifier
- Date and time of sample collection
- Initials of field personnel responsible for sample collection
- Analyses required
- Preservative type (if applicable)

### *2.2.8 PFAS Sample Collection*

Many materials (e.g., tape, labels, gloves) used during environmental investigations can potentially contain PFAS. There are two subcategories of materials used at a site; those materials that come into direct contact with the sample and those that do not. It is recommended, when possible, to exclude materials known to contain PFAS, such as those containing polytetrafluoroethylene (Teflon), perfluorinated ethylene-propylene (FEP), ethylene fluoroethylene (ETFE), low-density polyethylene (LDPE), polyvinylidene fluoride (PVDF), pipe thread compound and tape, and waterproof coatings. Because of this, 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, in addition to following proper decontamination procedures (Section 2.2.10), field personnel should be familiar with and follow



Ecology's *Guidance for Investigating and Remediating PFAS Contamination in Washington State* (Ecology 2023). This Guidance document references the Michigan Department of Environmental Quality PFAS sampling guidance document (MDEQ 2018), which contains a quick reference field guide for prohibited and allowable materials to be used during sample collection for PFAS analyses, included as Attachment A1.

### 2.2.9 *Sample Identification*

Each sample will be assigned a unique alphanumeric identifier using the following format:

- The first two characters identify the site (i.e., CM for Camas Mill).
- The next characters identify the collection method:
  - SG for surface sediment grab
  - SC for sediment core
- The next two (for cores) or three (for grab samples) characters identify the location (i.e., 01, 02, 03, and so on).
- Depth interval in feet for core samples (i.e., "0-0.5" for the top 0.5 foot of the core)
- The remaining characters identify the sampling date (YYMMDD).

Sample "CM-SG004-240710" represents a surface sediment grab collected at grab location 004 on July 10, 2024.

Sample "CM-SC08-1-1.5-240711" represents the 1- to 1.5 -foot depth interval from a sediment core collected at location 08 on July 11, 2024.

Field duplicates will be identified by adding 500 to the location ID. Sample "CM-SG504-240710" is the field duplicate of sample "CM-SG004-240710."

### 2.2.10 *Sample Transport and Chain-of-Custody Procedures*

The section addresses the sampling program requirements for maintaining custody of the samples throughout the sample collection and shipping process and provides specific procedures for sample shipping.

### 2.2.11 *Sample Custody Procedures*

Samples are considered to be in one's custody if they are as follows: 1) in the custodian's possession or view; 2) in a secured location (under lock) with restricted access; or 3) in a container that is secured with an official seal(s) such that the sample cannot be reached without breaking the seal(s).

Chain-of-custody procedures will be followed for all samples throughout the collection, processing, handling, and analyses processes. The principal document used to track possession and transfer of samples is the laboratory-provided chain-of-custody form. Each sample will be represented on a

chain-of-custody form the day it is collected. All data entries will be made using indelible ink pen. Corrections will be made by drawing a single line through the error, writing in the correct information, then dating and initialing the change. Blank lines on the chain-of-custody form will be lined-out and initialed by the individual maintaining custody.

A chain-of-custody form will accompany each cooler of samples to the laboratories. Each person relinquishing and accepting custody of the samples will sign the chain-of-custody forms and ensure that the samples are not left unattended unless properly secured or transferred. Copies of all chain-of-custody forms will be retained in the project files.

### *2.2.12 Sample Shipping and Receipt Requirements*

All samples will be shipped, or hand-delivered to the analytical laboratory as soon as practicable and without jeopardizing holding times. If samples are collected on Friday, they may be held until the following Monday for shipment. Specific sample shipping procedures are as follows:

- Each sample cooler or container will be shipped via overnight delivery to the appropriate laboratory. If Saturday delivery is required, the Field Coordinator (FC) will contact the analytical laboratory before 3:00 p.m. on Friday to ensure that the laboratory can accept the samples and is aware of the number of coolers shipped and the airbill tracking numbers. Following each shipment, the FC will verify the shipment from the day before has been received and is in good condition.
- Ice will be sealed in separate plastic bags and placed in the shipping containers. Ice will be double bagged if shipping via a commercial carrier.
- Individual samples will be placed in sealable plastic bags, packed to prevent breakage, and transported in an ice chest or other suitable container.
- Glass jars will be separated in the shipping container by shock absorbent material (e.g., bubble wrap) to prevent breakage.
- The shipping containers will be clearly labeled with sufficient information (name of project, time and date container was sealed, person sealing the container and consultant's office name and address) to enable positive identification.
- Chain-of-custody forms will be enclosed in a plastic bag and placed inside the cooler on top of the samples and ice.
- A minimum of two signed and dated chain-of-custody seals will be placed on adjacent sides of each cooler prior to shipping. Chain-of-custody seals are not required if samples are hand-delivered.
- Each cooler will be wrapped securely with packing tape and will be clearly labeled with the laboratory's shipping address and the consultant's return address.

Upon transfer of sample possession to the analytical laboratory, the persons transferring custody of the sample container will sign the chain-of-custody form. Upon receipt of samples at the laboratory, if present, the shipping container seals will be broken, and the receiver will record the condition of the samples on a sample receipt form. Chain-of-custody forms will be used internally by the laboratory to track sample handling and final disposition.

### *2.2.13 Waste Management*

Sediment leftover from surface grab samples will be lowered near to the mudline and returned to the collection site prior to moving to the next sampling station. All excess subsurface sediment will be containerized for proper disposal on shore.

All disposable sampling materials and personal protective equipment used in sample processing, such as disposable coveralls, gloves, and paper towels, will be placed in garbage bags or other appropriate containers and disposed of as municipal waste.

Sediment remaining after core processing will be containerized and consolidated. The excess sediment will be stored until it can be properly characterized and disposed of. A composite sample may be collected from the subsurface sediment and analyzed to obtain representative data for sediment disposal profiling, depending on regional disposal requirements.

## **2.3 Inadvertent Discovery Plan**

Based on observations during previous investigations it is unlikely cultural resources will be encountered during the field investigation; however, there is potential for inadvertent discovery of cultural resources while collecting field samples. Examples of cultural resources that may be encountered include the following:

- Accumulation of shell, burned rocks, or other food related materials
- Bones or small pieces of bone
- An area of charcoal or very dark stained soil with artifacts
- Stone tools or waste flakes (i.e., an arrowhead, or stone chips)
- Clusters of tin cans or bottles or logging or agricultural equipment that appears to be older than 50 years
- Buried railroad tracks, decking, or other industrial materials

If such items are discovered while processing samples, assume the material is a cultural resource. Stop work and immediately contact the FC and Anchor QEA's staff archaeologist, Barbara Bundy, PhD, RPA (Registered Professional Archaeologist), for further instructions.

### 3 Field and Laboratory Quality Assurance and Quality Control

Field and laboratory activities must be conducted in such a manner that results meet specified quality objectives and are fully defensible. Guidance for QA/QC is derived from the protocols developed for SMS (Ecology 2021), EPA Test Methods (1986), National Functional Guidelines (EPA 2020a, 2020b, 2020c), and the cited methods.

#### 3.1 Field Quality Assurance and Quality Control

Field QA procedures will consist of following acceptable practices for collecting and handling samples. Adherence to these procedures will be complemented by periodic and routine equipment inspection.

Field QA samples will be collected along with environmental samples. Field QA samples are useful in identifying possible problems resulting from sample collection or sample processing in the field. Field QA samples include field duplicates and additional sample mass for laboratory matrix duplicates (MDs), matrix spikes (MSs), and/or matrix spike duplicates (MSDs), as listed in Table A3-1.

Field duplicate samples will be collected to evaluate the variability attributable to sample homogenization and subsequent sample handling. Field duplicate samples will be collected from the same homogenized material as the original sample and analyzed as a separate sample for the same analyses as the parent sample. Field duplicates will be collected at a rate of one per 20 field samples collected, as listed in Table A3-1. Field duplicates will be screened against a relative percent difference (RPD) value of 50% when parent and duplicate sample results are greater than five times the reporting limit. Results that are less than five times the reporting limit will be evaluated by the difference between them and screened against a control limit of plus or minus two times the reporting limit for solid matrices.

Field QA samples will also include the collection of additional sample mass/volume to analyze the program-required analytical QA/QC samples (MD/MS/MSD) for analysis, as specified in Table A3-1. Additional sample mass/volume to meet this requirement will be collected at 1 per 20 samples collected.

#### 3.2 Analytical Laboratory Quality Assurance and Quality Control

Laboratory QC procedures, where applicable, include initial and continuing instrument calibrations, laboratory control samples, MDs, MSs, MSDs, surrogate spikes/labeled compounds (for organic analyses), and method blanks. QA/QC sample frequencies are provided in Table A3-1. A summary of the analytical data quality objectives (DQOs) is provided in Table A3-2.

The analyst will review the results of the QC samples from each sample group immediately after a sample group has been analyzed. The QC sample results will then be evaluated to determine if

control limits have been exceeded. If control limits are exceeded in the sample group, the QA/QC Manager will be contacted immediately, and corrective action (e.g., method modifications followed by reprocessing the affected samples) will be initiated prior to processing a subsequent group of samples.

### *3.2.1 Laboratory Instrument Calibration and Frequency*

An initial calibration will be performed on each laboratory instrument to be used prior to the start of project, after each major interruption to the analytical instrument, and when any ongoing calibration does not meet method control criteria. Calibration verification will be analyzed following each initial calibration and will meet method criteria prior to analyses of samples. Continuing calibration verifications will be analyzed at method-required frequencies to track instrument performance. The frequency of continuing calibration verifications varies with method. For gas chromatograph/mass spectrometer (GC/MS) methods, one will be analyzed every 12 hours. For liquid chromatography/MS (LC-MS/MS), gas chromatography, metals, and inorganic methods, one will be analyzed for every 10 field samples analyzed and at the end of each run. If the continuing calibration is out of control, the analysis will be terminated until the source of the control failure is eliminated or reduced to meet control specifications, which may include analyzing a new initial calibration. Any project samples analyzed while the instrument calibration was out of control will be reanalyzed.

Instrument blanks or continuing calibration blanks provide information on the stability of the baseline established. Continuing calibration blanks will be analyzed with each continuing calibration verification for each type of applicable analysis.

### *3.2.2 Laboratory Matrix Duplicates*

Laboratory MDs provide information on the precision of the analysis and are useful in assessing potential sample heterogeneity and matrix effects. Analytical duplicates are subsamples of the original sample that are prepared and analyzed as a separate sample.

### *3.2.3 Matrix Spikes and Matrix Spike Duplicates*

Analyses of MS samples provide information on the extraction efficiency of the method on the sample matrix, as well as any interferences introduced by the sample matrix. By performing duplicate MS (MSD) analyses, information on the precision of the method is also provided.

### *3.2.4 Method Blanks*

Method blanks are prepared and analyzed in the same manner as project samples to assess possible laboratory contamination at all stages of sample preparation and analysis. The method blank for all analyses must be less than the method reporting limit of any single target analyte/compound. If a laboratory method blank exceeds this criterion for any analyte/compound, and the concentration of

the analyte/compound in any of the samples is less than five times the concentration found in the blank (10 times for common contaminants), analyses must stop, and the source of contamination must be eliminated or reduced. Affected samples should be reprepared and reanalyzed, if possible.

### *3.2.5 Laboratory Control Samples/Ongoing Precision and Recovery*

Laboratory control samples (LCSs) or ongoing precision and recovery samples (OPRs) are analyzed to assess possible laboratory bias at all stages of sample preparation and analysis. The LCS/OPR is a matrix-dependent spiked sample prepared at the time of sample extraction along with the preparation of the samples, MD/MS/MSD, and method blank. The LCS/OPR will provide information on the accuracy of the analytical process, and when analyzed in duplicate, will provide precision information as well.

## **3.3 Bioassay Laboratory Quality Control**

If performed, sediment toxicity tests will incorporate standard QA/QC procedures to ensure that the test results are valid. Standard QA/QC procedures include the use of negative controls, positive controls, replicates, and measurements of water quality during testing. Consistent with SMS SCUM Guidance (Ecology 2021), reference sediments are not necessary for freshwater bioassays. The freshwater biological criteria are based on a comparison to control treatments.

### *3.3.1 Negative Controls*

The negative control to be used for both sediment toxicity tests will be a clean control, which consists of clean, inert material and the same water used in testing sediment toxicity. Negative control performance standards for this bioassay program are presented in Table 5-10 of SCUM (Ecology 2021).

### *3.3.2 Positive Controls*

An appropriate reference toxicant will be run with each batch of test sediments as a positive control to establish the relative sensitivity of the test organisms. The positive control for sediment tests is typically conducted with diluent freshwater and without sediment. The LC<sub>50</sub> or the EC<sub>50</sub> must be within the 95% confidence interval of responses expected for the toxicant used.<sup>1</sup>

### *3.3.3 Replicates*

Eight replicate chambers and one surrogate chamber for water quality measurements for each test sediment and negative control treatments will be run for each bioassay. A water quality replicate will also be run for each treatment.

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<sup>1</sup> LC<sub>50</sub> is the lethal concentration of toxicant killing 50% of exposed organisms. EC<sub>50</sub> is the concentration of test substance in dilution water that is calculated to affect 50% of a test population during continuous exposure over a specified time period.



### 3.3.4 *Water Quality Monitoring*

Water quality monitoring will be conducted for the amphipod and midge bioassays and reference toxicant tests. Water quality conditions, including temperature, dissolved oxygen, pH, and sulfides and ammonia concentrations will be measured during testing to ensure they are within required ranges. Temperature, dissolved oxygen, and pH will be measured daily. Conductivity, hardness, alkalinity, ammonia, and sulfides will be measured at the beginning and the end of testing. Measurements of ammonia and sulfide in porewater will be made upon sample receipt. Measurements for each treatment will be made on a separate test chamber that is set up identically to the other replicates within the treatment group, including the addition of test organisms.

## 4 Documentation, Recordkeeping, and Reporting Requirements

This section describes field and laboratory documentation and recordkeeping, data validation, and data reporting requirements.

### 4.1 Documentation and Records

This project will require central project files, to be maintained at Anchor QEA.

#### 4.1.1 *Field Records*

Documentation will consist of a daily field log and sample collection forms. The daily field log is intended to provide sufficient data and observations to enable readers to reconstruct events that occurred during the sampling period. Examples of information to be recorded are field personnel, weather conditions, complications encountered, field communications, and other general details associated with the sampling effort. At a minimum, the following information will be included in this log:

- Names of the FC and person(s) collecting and logging the sample
- The sample station number
- Date and collection time of each sediment sample
- Observations made during sample collection including weather conditions, complications, communications, and other details associated with the sampling effort
- Qualitative notation of apparent resistance of sediment column to sampling, including notes on debris
- Any deviations from the approved SQAPP

In addition to maintaining a daily field log, sample collection forms will be completed for each grab and core collected, and processing forms will be completed for each core. The sample collection forms will include standard entries for station identifiers, station coordinates, date and time of sample location, type of samples collected, type of analyses for each sample, and specific information pertaining to the matrix being collected. For sediment core samples, the collection form will include information regarding penetration of the sampler and physical characteristics of the sediment such as texture, color, odor, stratification, and sheens. Core processing forms will include sediment core length available for processing, sediment descriptions as detailed in Section 2.2.3.2, samples collected, and depths of collection.

The field forms may be completed electronically or on hard copies. If hard copies are used, forms will be on water-resistant, durable paper for adverse field conditions. All data entries will be made using indelible, waterproof blue- or black-ink pen. Corrections will be made by drawing a single line

through the error, writing in the correct information, then dating and initialing the change. Each form will be marked with the project name, number, and date. The field forms will be scanned as needed and uploaded into Anchor QEA's project file directory as convenient during the sampling event or upon completion of each sampling event. The field forms are included in Attachment A2.

#### 4.1.2 *Analytical Laboratory Data Deliverable*

Data packages will be checked for completeness immediately upon receipt from the laboratory to ensure that data and QA/QC information requested are present. The analytical laboratory will be required, where applicable, to report the following:

- **Project Narrative:** This summary, in the form of a cover letter, will include a discussion of any problems encountered during analyses. This summary should include (but not be limited to) QA/QC, sample shipment, sample storage, and analytical difficulties. Any problems encountered, actual or perceived, and their resolutions will be documented in as much detail as appropriate.
- **Chain-of-Custody Records:** Legible copies of the chain-of-custody forms will be provided as part of the data package. This documentation will include the time of receipt and condition of each sample received by the laboratory. Additional internal tracking of sample custody by the laboratory will also be documented on a sample receipt form. The form must include sample shipping container temperatures measured at the time of sample receipt.
- **Sample Results:** The data package will summarize the results for each sample analyzed. The summary will include the following information when applicable:
  - Field sample identification code and the corresponding laboratory identification code
  - Sample matrix
  - Date of sample preparation/extraction
  - Date and time of analysis
  - Mass and/or volume used for preparation and analysis
  - Final dilution or concentration factors for the sample
  - Identification of the instrument used for analysis
  - Method detection limits or estimated detection limits and method reporting limits accounting for sample-specific factors (e.g., dilution and total solids)
  - Analytical results with reporting units identified
  - Data qualifiers and their definitions
  - An electronic data deliverable with data in a format specified in advance by Anchor QEA
- **QA/QC Summaries:** This section will contain the results of the laboratory QA/QC analyses. Each QA/QC sample analysis will be documented with the same information required for the sample results. No recovery or blank corrections will be made by the laboratory. The required summaries are as follows (additional information may be requested):

- **Instrument Tunes:** Ion abundances and criteria will be reported for each instrument tune analyzed in association with instrument calibrations and sample analyses.
- **Calibration Data Summary:** This summary will report the concentrations of the initial calibration and daily calibration standards and the dates and times of analyses. Response factors, percent relative standard deviations, percent differences, retention times, correlation coefficient, and coefficient of determination for each analyte will be listed, as applicable to the analysis. Calibration results for standards will be documented to indicate instrument sensitivity.
- **Internal Standard Area Summary:** Internal standard areas or recoveries will be reported as applicable to the method.
- **Method Blank:** Method blank results associated with each sample and the concentration of all target analytes identified in the blanks will be reported.
- **Surrogate Spikes and Labeled Compound Recoveries:** All surrogate spike and labeled compound recoveries for organic analyses will be reported as required by the method. The names and concentrations of all compounds added, percent recoveries, and range of acceptable recoveries will be reported.
- **MS Recovery:** MS recovery data for all applicable analyses will be reported. The names and concentrations of analytes added, percent recoveries, and range of acceptable recoveries will be listed. The percent recoveries and RPD values for MS duplicate analyses will be reported.
- **MDs:** RPD values for MD analyses will be reported.
- **LCSs:** LCS recovery data will be reported. The names and concentrations of analytes added, percent recoveries, and range of acceptable recoveries will be reported. Percent recoveries and RPD values for LCS duplicate analyses will be reported.
- **Relative Retention Times:** Relative retention times of each analyte detected in the samples for both primary and confirmational analyses will be reported.
- **Original Data:** Legible copies of the original data generated by the laboratory will include the following information:
  - Sample extraction, preparation, and cleanup logs including methods used
  - Instrument analysis logs for all instruments used on days of calibration and sample analyses
  - Calculation worksheets as applicable
  - Ion chromatograms for all samples, standards, blanks, calibrations, spikes, replicates, and reference materials
  - Copies of full scan chromatograms and quantitation reports for GC and/or GC/MS analyses of samples, standards, blanks, calibrations, spikes, replicates, and reference materials

- Enhanced spectra of detected compounds with associated best-match spectra for each sample
- Instrument outputs for all inorganic analyses

### 4.1.3 *Bioassay Laboratory Data Deliverable*

If bioassay tests are required, the laboratory conducting the testing will be responsible for internal checks on data reporting and will correct any errors identified during the QA review. Results that include all information recommended by the applicable protocols described in Section 3.3 for QA review will be reported, as follows:

- A narrative description of the testing conducted, including any deviations from the methodology or problems with the testing process and procedures
- Test methods used for bioassays and statistical analyses
- Results for survival, growth, water quality parameters, reference toxicant, and statistical analyses
- Original data sheets for water quality, survival, growth, reference toxicant, and statistical analyses
- Chain-of-custody records

Close contact with the laboratory will be maintained to resolve any QA/QC problems in a timely manner.

## 4.2 Data Reduction

Data reduction is the process by which original data (analytical measurements) are converted or reduced to a specified format or unit to facilitate analysis of the data. Data reduction requires that all aspects of sample preparation that could affect the test result, such as sample mass extracted or analyzed, moisture content, or dilutions required, be used in the calculation of the result. The laboratory analyst is responsible for data reduction, which is subjected to further review by the Laboratory Manager, the project manager, the QA/QC Manager, and independent reviewers. Data reduction may be performed manually or electronically. If performed electronically, all software used must be demonstrated to be true and free from error.

## 4.3 Data Management

Field data sheets will be checked for completeness and accuracy by the FC prior to delivery to the data manager. All data generated in the field will be documented and provided to the data manager, who is responsible for the data's entry into the database. All manually entered data will be checked by a second party. Field documentation will be filed in the main project file after data entry and checking are complete.

Laboratory data will be provided to the data manager in the EQUIS electronic format. The laboratory data that are provided electronically and loaded into the database will undergo a 10% check against the laboratory hard copy data. Data will be validated manually and qualifiers, if assigned, will be entered manually. The accuracy of all manually entered data will be verified by a second party.

## 5 Data Validation and Usability

This section describes the processes that will be used to review project data quality.

### 5.1 Data Review, Validation, and Verification

Data will be validated following Stage 2B data validation protocols (EPA 2009). During the validation process, analytical data will be evaluated for method QC and laboratory QC compliance, and their validity and applicability for program purposes will be determined. Based on the findings of the validation process, data validation qualifiers may be assigned. The validated project data, including qualifiers, will be entered into the project database, thus enabling this information to be retained or retrieved, as needed. Validation reports will be filed with the laboratory analytical data reports.

### 5.2 Validation and Verification Methods

Data validation includes signed entries by the field and laboratory technicians on field data forms and laboratory data sheets, respectively; review for completeness and accuracy by the FC and Laboratory Manager; review by the QA/QC Manager (or designee) for outliers and omissions; and the use of QC criteria to accept or reject specific data. All data will be loaded into the project database.

All laboratory data will be reviewed and verified to determine whether DQOs have been met and that appropriate corrective actions have been taken, when necessary. The project QA/QC Manager or designee will be responsible for the final review of all data generated from analyses of samples.

The first level of review will take place in the laboratory as the data are generated. The Laboratory Manager or designee will be responsible for ensuring that the data generated meet minimum QA/QC requirements and that the instruments were operating under acceptable conditions during generation of data. DQOs will also be assessed at this point by comparing the results of QC measurements with pre-established criteria as a measure of data acceptability.

The analysts and/or laboratory department manager will prepare a preliminary QC checklist for each analytical parameter and for each sample delivery group as soon as analysis of a sample delivery group has been completed. Any deviations from the DQOs listed on the checklist will be brought to the attention of the Laboratory Manager to determine whether corrective action is needed and to determine the impact on the reporting schedule.

Data packages will be checked for completeness upon receipt from the laboratory to ensure that data and QA/QC information requested are present. Data quality will be assessed for all data by a reviewer following this SQAPP and EPA's National Functional Guidelines (EPA 2020a, 2020b, 2020c), by considering the following:

- Laboratory sample receipt
- Holding times



- Instrument tunes
- Initial calibrations
- Continuing calibrations
- Method blanks
- Surrogate recoveries
- Labeled compound recoveries
- Internal standard results
- Detection limits
- Quantitation limits
- Dual-column confirmation results
- LCSs
- MS/MSD samples
- Laboratory replicates

Additional method-specific criteria will be reviewed in addition to these criteria as required per the level of validation. The data will be validated in accordance with the project-specific DQOs, method criteria, and the laboratory's internal performance standards based on their Standard Operating Procedures.

### **5.3 Reconciliation with User Requirements**

The QA/QC Manager will review data after each field event to determine if DQOs have been met. If data do not meet the project's specifications, the QA/QC Manager will review the noncompliance and determine if the issue is due to calibration/maintenance, sampling techniques, or other factors and will suggest corrective action as necessary. Issues are expected to be resolved by retraining, revision of techniques, or replacement of supplies or equipment. If issues are not resolved, DQOs will be reviewed for feasibility. If specific DQOs are not achievable, the QA/QC Manager will recommend appropriate modifications.

## 6 References

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- EPA (U.S. Environmental Protection Agency), 1986. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. EPA 530/SW-846.
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- MDEQ (Michigan Department of Environmental Quality), 2018. *Sediment PFAS Sampling Guidance*. Available at: <https://www.michigan.gov/pfasresponse/investigations/sampling-guidance>.

# Tables

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**Table A2-1**  
**Target Sampling Locations and Analytical Testing**

Station ID	Sample Type/ Purpose	Sample Interval	Sample ID	Coordinates <sup>1</sup>		Conventional <sup>2</sup>	Grain size	Metals	SVOCs	Pesticides	PCBs	TPH	Dioxin/ Furans	PFAS	Archive
				Northing	Easting										
CM-SG001	Sediment Grab Samples – Wood Debris Observations <sup>3</sup>	0 - 10 cm	CM-SG001-YYMMDD	45.5769878	-122.4461962	X	Note 4								
CM-SG002		0 - 10 cm	CM-SG002-YYMMDD	45.57675718	-122.4442716	X	Note 4								
CM-SG003		0 - 10 cm	CM-SG003-YYMMDD	45.57651341	-122.4423503	X	Note 4								
CM-SG004		0 - 10 cm	CM-SG004-YYMMDD	45.57628349	-122.4404255	X	Note 4								
CM-SG005		0 - 10 cm	CM-SG005-YYMMDD	45.57582592	-122.4385851	X	Note 4								
CM-SG006		0 - 10 cm	CM-SG006-YYMMDD	45.57582652	-122.4366327	X	Note 4								
CM-SG007		0 - 10 cm	CM-SG007-YYMMDD	45.57568757	-122.4346903	X	Note 4								
CM-SG008		0 - 10 cm	CM-SG008-YYMMDD	45.57575485	-122.4327403	X	Note 4								
CM-SG009		0 - 10 cm	CM-SG009-YYMMDD	45.57603634	-122.4308295	X	Note 4								
CM-SG010		0 - 10 cm	CM-SG010-YYMMDD	45.57650386	-122.4289941	X	Note 4								
CM-SG011		0 - 10 cm	CM-SG011-YYMMDD	45.57712012	-122.42725	X	Note 4								
CM-SG012		0 - 10 cm	CM-SG012-YYMMDD	45.57771454	-122.4254906	X	Note 4								
CM-SG013		0 - 10 cm	CM-SG013-YYMMDD	45.57807033	-122.423605	X	Note 4								
CM-SG014		0 - 10 cm	CM-SG014-YYMMDD	45.57836115	-122.421697	X	Note 4								
CM-SG015		0 - 10 cm	CM-SG015-YYMMDD	45.57875735	-122.4198278	X	Note 4								
CM-SG016		0 - 10 cm	CM-SG016-YYMMDD	45.57924338	-122.4180021	X	Note 4								
CM-SG017		0 - 10 cm	CM-SG017-YYMMDD	45.57971802	-122.4161703	X	Note 4								
CM-SG018		0 - 10 cm	CM-SG018-YYMMDD	45.58012157	-122.4143043	X	Note 4								
CM-SG019		0 - 10 cm	CM-SG019-YYMMDD	45.57866133	-122.4174245	X	Note 4								
CM-SG020		0 - 10 cm	CM-SG020-YYMMDD	45.5780678	-122.4191846	X	Note 4								
CM-SG021		0 - 10 cm	CM-SG021-YYMMDD	45.57778729	-122.4210958	X	Note 4								
CM-SG022		0 - 10 cm	CM-SG022-YYMMDD	45.577324	-122.4229334	X	Note 4								
CM-SG023		0 - 10 cm	CM-SG023-YYMMDD	45.57676405	-122.4247156	X	Note 4								
CM-SG024		0 - 10 cm	CM-SG024-YYMMDD	45.57644168	-122.4266132	X	Note 4								
CM-SG025		0 - 10 cm	CM-SG025-YYMMDD	45.57582359	-122.428356	X	Note 4								
CM-SG026		0 - 10 cm	CM-SG026-YYMMDD	45.57531373	-122.4301684	X	Note 4								
CM-SG027		0 - 10 cm	CM-SG027-YYMMDD	45.57495108	-122.4320512	X	Note 4								
CM-SG028		0 - 10 cm	CM-SG028-YYMMDD	45.57455538	-122.4339205	X	Note 4								
CM-SG029		0 - 10 cm	CM-SG029-YYMMDD	45.57434305	-122.4358493	X	Note 4								
CM-SG030		0 - 10 cm	CM-SG030-YYMMDD	45.57438914	-122.4378005	X	Note 4								
CM-SG031		0 - 10 cm	CM-SG031-YYMMDD	45.57443558	-122.4397517	X	Note 4								
CM-SG032		0 - 10 cm	CM-SG032-YYMMDD	45.57478748	-122.4416386	X	Note 4								
CM-SG033		0 - 10 cm	CM-SG033-YYMMDD	45.57504837	-122.4435553	X	Note 4								
CM-SG034		0 - 10 cm	CM-SG034-YYMMDD	45.57518308	-122.4450656	X	Note 4								
CM-SG035		0 - 10 cm	CM-SG035-YYMMDD	45.57466754	-122.4442977	X	Note 4								
CM-SG036		0 - 10 cm	CM-SG036-YYMMDD	45.57367917	-122.4429445	X	Note 4								
CM-SG037		0 - 10 cm	CM-SG037-YYMMDD	45.57287333	-122.441365	X	Note 4								
CM-SG038		0 - 10 cm	CM-SG038-YYMMDD	45.57214836	-122.439708	X	Note 4								
CM-SG039		0 - 10 cm	CM-SG039-YYMMDD	45.5712221	-122.4382686	X	Note 4								
CM-SG040		0 - 10 cm	CM-SG040-YYMMDD	45.57070102	-122.4364628	X	Note 4								
CM-SG041		0 - 10 cm	CM-SG041-YYMMDD	45.57041018	-122.4345551	X	Note 4								
CM-SG042		0 - 10 cm	CM-SG042-YYMMDD	45.57026316	-122.4326141	X	Note 4								
CM-SG043		0 - 10 cm	CM-SG043-YYMMDD	45.57010696	-122.4306747	X	Note 4								
CM-SG044		0 - 10 cm	CM-SG044-YYMMDD	45.56992444	-122.4287398	X	Note 4								

**Table A2-1**  
**Target Sampling Locations and Analytical Testing**

Station ID	Sample Type/ Purpose	Sample Interval	Sample ID	Coordinates <sup>1</sup>		Conventional <sup>2</sup>	Grain size	Metals	SVOCs	Pesticides	PCBs	TPH	Dioxin/ Furans	PFAS	Archive	
				Northing	Easting											
CM-SG045	Sediment Grab Samples – Chemistry Analyses	0 - 10 cm	CM-SG045-YYMMDD	45.58090263	-122.4105724	X	Note 4	X	X	X	X	X	X	X		
CM-SG046		0 - 10 cm	CM-SG046-YYMMDD	45.58109659	-122.4100684	X	Note 4	X	X	X	X	X	X	X		
CM-SG047		0 - 10 cm	CM-SG047-YYMMDD	45.5807899	-122.4100535	X	Note 4	X	X	X	X	X	X	X		
CM-SG048		0 - 10 cm	CM-SG048-YYMMDD	45.58122512	-122.4094799	X	Note 4	X	X	X	X	X	X	X		
CM-SG049		0 - 10 cm	CM-SG049-YYMMDD	45.58095518	-122.4095266	X	Note 4	X	X	X	X	X	X	X		
CM-SG050		0 - 10 cm	CM-SG050-YYMMDD	45.58129644	-122.4089868	X	Note 4	X	X	X	X	X	X	X		
CM-SG051		0 - 10 cm	CM-SG051-YYMMDD	45.58099348	-122.4089829	X	Note 4	X	X	X	X	X	X	X		
CM-SG052		0 - 10 cm	CM-SG052-YYMMDD	45.58135288	-122.4086322	X	Note 4	X	X	X	X	X	X	X		
CM-SG053		0 - 10 cm	CM-SG053-YYMMDD	45.58102726	-122.4083592	X	Note 4	X	X	X	X	X	X	X		
CM-SG054		0 - 10 cm	CM-SG054-YYMMDD	45.58134098	-122.4077311	X	Note 4	X	X	X	X	X	X	X		
CM-SG055		0 - 10 cm	CM-SG055-YYMMDD	45.58105578	-122.4078209	X	Note 4	X	X	X	X	X	X	X		
CM-SG056		0 - 10 cm	CM-SG056-YYMMDD	45.5807378	-122.4081129	X	Note 4	X	X	X	X	X	X	X		
CM-SG057		0 - 10 cm	CM-SG057-YYMMDD	45.58138661	-122.4072326	X	Note 4	X	X	X	X	X	X	X		
CM-SG058		0 - 10 cm	CM-SG058-YYMMDD	45.58099771	-122.4073033	X	Note 4	X	X	X	X	X	X	X		
CM-SG059		0 - 10 cm	CM-SG059-YYMMDD	45.58122108	-122.4064979	X	Note 4	X	X	X	X	X	X	X		
CM-SG060		0 - 10 cm	CM-SG060-YYMMDD	45.58100948	-122.4067893	X	Note 4	X	X	X	X	X	X	X		
CM-SG061		0 - 10 cm	CM-SG061-YYMMDD	45.58072873	-122.4068575	X	Note 4	X	X	X	X	X	X	X		
CM-SG062		0 - 10 cm	CM-SG062-YYMMDD	45.58112922	-122.4060014	X	Note 4	X	X	X	X	X	X	X		
CM-SG063		0 - 10 cm	CM-SG063-YYMMDD	45.58070883	-122.4060605	X	Note 4	X	X	X	X	X	X	X		
CM-SG064		0 - 10 cm	CM-SG064-YYMMDD	45.58101061	-122.4054693	X	Note 4	X	X	X	X	X	X	X		
CM-SG065	0 - 10 cm	CM-SG065-YYMMDD	45.5809294	-122.4048823	X	Note 4	X	X	X	X	X	X	X			
CM-SG066	0 - 10 cm	CM-SG066-YYMMDD	45.5808173	-122.4043245	X	Note 4	X	X	X	X	X	X	X			
CM-SG067	0 - 10 cm	CM-SG067-YYMMDD	45.58043873	-122.4033507	X	Note 4	X	X	X	X	X	X	X			
CM-SG068	0 - 10 cm	CM-SG068-YYMMDD	45.580213	-122.4028626	X	Note 4	X	X	X	X	X	X	X			
CM-SG069	0 - 10 cm	CM-SG069-YYMMDD	45.57999334	-122.4023746	X	Note 4	X	X	X	X	X	X	X			
CM-SG070	0 - 10 cm	CM-SG070-YYMMDD	45.57984324	-122.4019064	X	Note 4	X	X	X	X	X	X	X			
CM-SC01	Sediment Core Samples	0 - 0.5 ft	CM-SC01-0-0.5-YYMMDD	45.58095518	-122.4095266	X		X	X	X	X	X	X	X		
		0.5 - 1 ft	CM-SC01-0.5-1-YYMMDD	45.58095518	-122.4095266	X		X	X	X	X	X	X	X		
		1 - 1.5 ft	CM-SC01-1-1.5-YYMMDD	45.58095518	-122.4095266	X		X	X	X	X	X	X	X		
		1.5 - 2 ft	CM-SC01-1.5-2-YYMMDD	45.58095518	-122.4095266	X		X	X	X	X	X	X	X		
>2 ft, 0.5 ft intervals		CM-SC01-UI-LI-YYMMDD	45.58095518	-122.4095266											X	
CM-SC02		0 - 0.5 ft	CM-SC02-0-0.5-YYMMDD	45.58135288	-122.4086322	X			X	X	X	X	X	X	X	
		0.5 - 1 ft	CM-SC02-0.5-1-YYMMDD	45.58135288	-122.4086322	X			X	X	X	X	X	X	X	
		1 - 1.5 ft	CM-SC02-1-1.5-YYMMDD	45.58135288	-122.4086322	X			X	X	X	X	X	X	X	
		1.5 - 2 ft	CM-SC02-1.5-2-YYMMDD	45.58135288	-122.4086322	X			X	X	X	X	X	X	X	
		>2 ft, 0.5 ft intervals	CM-SC02-UI-LI-YYMMDD	45.58135288	-122.4086322											X

**Table A2-1**  
**Target Sampling Locations and Analytical Testing**

Station ID	Sample Type/ Purpose	Sample Interval	Sample ID	Coordinates <sup>1</sup>		Conventionals <sup>2</sup>	Grain size	Metals	SVOCs	Pesticides	PCBs	TPH	Dioxin/ Furans	PFAS	Archive	
				Northing	Easting											
CM-SC03	Sediment Core Samples	0 - 0.5 ft	CM-SC03-0-0.5-YYMMDD	45.58102726	-122.4083592	X		X	X	X	X	X	X	X		
		0.5 - 1 ft	CM-SC03-0.5-1-YYMMDD	45.58102726	-122.4083592	X		X	X	X	X	X	X	X	X	
		1 - 1.5 ft	CM-SC03-1-1.5-YYMMDD	45.58102726	-122.4083592	X		X	X	X	X	X	X	X	X	
		1.5 - 2 ft	CM-SC03-1.5-2-YYMMDD	45.58102726	-122.4083592	X		X	X	X	X	X	X	X	X	
		>2 ft, 0.5 ft intervals	CM-SC03-UI-LI-YYMMDD	45.58102726	-122.4083592											X
CM-SC04		0 - 0.5 ft	CM-SC04-0-0.5-YYMMDD	45.58134098	-122.4077311	X		X	X	X	X	X	X	X	X	
		0.5 - 1 ft	CM-SC04-0.5-1-YYMMDD	45.58134098	-122.4077311	X		X	X	X	X	X	X	X	X	
		1 - 1.5 ft	CM-SC04-1-1.5-YYMMDD	45.58134098	-122.4077311	X		X	X	X	X	X	X	X	X	
		1.5 - 2 ft	CM-SC04-1.5-2-YYMMDD	45.58134098	-122.4077311	X		X	X	X	X	X	X	X	X	
		>2 ft, 0.5 ft intervals	CM-SC04-UI-LI-YYMMDD	45.58134098	-122.4077311											X
CM-SC05		0 - 0.5 ft	CM-SC05-0-0.5-YYMMDD	45.58099771	-122.4073033	X		X	X	X	X	X	X	X	X	
		0.5 - 1 ft	CM-SC05-0.5-1-YYMMDD	45.58099771	-122.4073033	X		X	X	X	X	X	X	X	X	
		1 - 1.5 ft	CM-SC05-1-1.5-YYMMDD	45.58099771	-122.4073033	X		X	X	X	X	X	X	X	X	
		1.5 - 2 ft	CM-SC05-1.5-2-YYMMDD	45.58099771	-122.4073033	X		X	X	X	X	X	X	X	X	
		>2 ft, 0.5 ft intervals	CM-SC05-UI-LI-YYMMDD	45.58099771	-122.4073033											X
CM-SG1##	Field duplicate (SG) <sup>5</sup>	0 - 10 cm	TBD			X		X	X	X	X	X	X	X		
CM-SC1##	Field duplicate (SC) <sup>5</sup>	TBD	TBD			X		X	X	X	X	X	X	X		

Notes:

- Coordinates are in North American Datum of 1983, Washington State Plane North, U.S. feet.
- Conventionals include ammonia, sulfides, total solids, total volatile solids, and total organic carbon.
- Sediment will be collected for bioassay testing in wood debris grabs with greater than 25% observed wood content. Up to five samples will be triggered for bioassay testing.
- Grain size analyses will be selected in the field. Up to 20 samples will be selected for analysis.
- Field duplicates will be collected at a rate of 1 per 20 samples for chemical analyses. Field duplicates will not be collected for bioassay testing.

ft: foot

LI: lower interval in feet

NA: not applicable

PCBs: polychlorinated biphenyls

PFAS: perfluoroalkyl and polyfluoroalkyl substances

S2-: sulfide

SC: sediment core

SG: sediment grab

SVOC: semivolatile organic compound

SW: surface water

TBD: to be determined

TOC: total organic carbon

TS: total solids

UI: upper interval in feet

**Table A2-2**  
**Sample Handling and Storage Guidelines**

Parameter	Sample Size	Container Size and Type <sup>1</sup>	Holding Time	Preservative
Grain size	300 g	16-oz glass or HDPE	6 months	<6°C
Total solids, total organic carbon, total volatile solids	30 g	8-oz glass or HDPE	14 days	<6°C
			6 months	-18°C ± 2°C
Ammonia	25 g	4-oz glass	7 days	<6°C
Total sulfides	50 g	2-oz glass	7 days	5 mL 2-Normal zinc acetate/dark/<6°C
Total metals	10 g	4-oz glass	6 months; 28 days for mercury	<6°C
			2 years; 1 year for mercury	<-10°C
SVOCs, PAHs, PCBs, pesticides, TPH	200 g	2 x 16-oz glass	14 days until extraction	<6°C
			1 year until extraction	<-10°C
			40 days after extraction	<6°C
Dioxins/furans	10 g	4-oz amber glass	14 days until extraction	<6°C
			1 year until extraction	<-10°C
PFAS	5 g	8-oz HDPE	90 days to extraction	<6°C
			28 days to analysis	<6°C
Archives	500 g	16-oz glass	1 year until extraction	<-10°C
Bioassays	500 g	2-gallon HDPE bucket	8 weeks	2°–6°C; no headspace

Notes:

1. Sample containers may vary based on laboratory selection and availability at the time of sample collection.

g: gram

HDPE: high-density polyethylene

mL: milliliter

mL: milliliter

oz: ounce

PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated biphenyl

PFAS: perfluoroalkyl and polyfluoroalkyl substances

SVOC: semivolatile organic compound

TPH: total petroleum hydrocarbons

**Table A2-3**  
**Freshwater Bioassay Performance Standards and Evaluation Guidelines**

Biological Test Endpoint	Performance Standard		SCO <sup>3</sup>	CSL <sup>3</sup>
	Control <sup>1</sup>	Reference <sup>2</sup>		
<i>Hyalella azteca</i>				
28-Day Mortality	$M_C \leq 20\%$	$M_R \leq 30\%$	$M_C - M_T > 10\%$	$M_T - M_C > 25\%$
28-Day Growth	$MIG_C \geq 0.15$ mg/ individual	$MIG_R \geq 0.15$ mg/ individual	$MIG_T/MIG_C < 0.75$	$MIG_T/MIG_C < 0.6$
<i>Chironomus dilutus</i>				
10-Day Mortality	$M_C \leq 30\%$	$M_R \leq 30\%$	$M_C - M_T > 20\%$	$M_T - M_C > 30\%$

Notes:

1. These tests and parameters were developed based on the most updated ASTM protocols.
2. Reference performance standards are provided for sites where Ecology has approved a freshwater reference sediment site(s), and reference results will be substituted for control in comparing test sediment to criteria.
3. A statistical significance is set at  $\alpha = 0.05$  (i.e., an exceedance of the criteria occurs when  $p < 0.05$ ).

ASTM: ASTM International

C: control

CSL: cleanup screening level

Ecology: Washington State Department of Ecology

M: mortality

MIG: mean individual growth at time final

R: reference

SCO: sediment cleanup objective

T: test



Table A2-4

## Parameters for Analysis, Screening Levels, Analytical Methods, and Target Quantitation Limits

Parameter	Analytical Method	Method Detection Limit <sup>a</sup>	Quantitation Limit <sup>a</sup>	SMS Freshwater Sediment	
				Sediment Cleanup Objective	Cleanup Screening Level
<b>Conventional Parameters (%)</b>					
Grain size	PSEP/ASTM Mod	---	0.1	---	---
Total solids	SM2540G	---	0.1	---	---
Total volatile solids	SM2540G	---	0.1	---	---
Total organic carbon	EPA 9060 Mod	---	0.1	---	---
<b>Conventional Parameters (mg/kg dry weight)</b>					
Ammonia	SM 4500-NH3	---	0.4	---	---
Total sulfides	SM 4500-S2	---	1.0	---	---
<b>Metals (mg/kg dry weight)</b>					
Arsenic	EPA 6020B	0.038	0.20	14	120
Cadmium	EPA 6020B	0.040	0.10	2.1	5.4
Chromium	EPA 6020B	0.26	0.50	72	88
Copper	EPA 6020B	0.35	0.50	400	1200
Lead	EPA 6020B	0.052	0.10	360	> 1300 <sup>b</sup>
Mercury	7471B	0.0053	0.025	0.66	0.8
Nickel	EPA 6020B	0.22	0.50	26	110
Selenium	EPA 6020B	0.18	0.50	11	> 20 <sup>b</sup>
Silver	EPA 6020B	0.022	0.20	0.57	1.7
Zinc	EPA 6020B	2.9	6.0	3200	> 4200 <sup>b</sup>
<b>Semivolatile Organic Compounds (µg/kg dry weight)</b>					
<b>Polycyclic Aromatic Hydrocarbons</b>					
1-Methylnaphthalene	EPA 8270E	5.3	20	---	---
2-Methylnaphthalene	EPA 8270E	4.5	20	---	---
Acenaphthene	EPA 8270E	5.2	20	---	---
Acenaphthylene	EPA 8270E	6.2	20	---	---
Anthracene	EPA 8270E	7.2	20	---	---
Benzo(a)anthracene	EPA 8270E	6.0	20	---	---
Benzo(a)pyrene	EPA 8270E	4.2	20	---	---
Benzo(g,h,i)perylene	EPA 8270E	14	20	---	---
Chrysene	EPA 8270E	6.1	20	---	---
Dibenz(a,h)anthracene	EPA 8270E	17	20	---	---
Fluoranthene	EPA 8270E	6.1	20	---	---
Fluorene	EPA 8270E	15	20	---	---
Indeno(1,2,3-cd)pyrene	EPA 8270E	15	20	---	---
Naphthalene	EPA 8270E	4.2	20	---	---
Phenanthrene	EPA 8270E	8.7	20	---	---
Pyrene	EPA 8270E	5.7	20	---	---
Total benzo(b,j,k)fluoranthenes	EPA 8270E	10	40	---	---
Total PAHs (U = 0) <sup>c</sup>	Calculated	---	---	17,000	30,000
<b>Phthalates</b>					
Di-n-butyl phthalate	EPA 8270E	5.6	20	380	1000
Bis(2-ethylhexyl) phthalate	EPA 8270E	5.5	50	500	22,000
Di-n-octyl phthalate	EPA 8270E	4.4	20	39	> 1100 <sup>b</sup>
<b>Phenols</b>					
Phenol	EPA 8270E	4.4	20	120	210
4-Methylphenol	EPA 8270E	7.4	20	260	2000
Pentachlorophenol	EPA 8270E	31.2	100	1200	> 1200 <sup>b</sup>
<b>Miscellaneous Extractables</b>					
Benzoic Acid	EPA 8270E	39	200	2900	3800
Dibenzofuran	EPA 8270E	14	20	200	680
Carbazole	EPA 8270E	4.3	20	900	1100
<b>Pesticides (µg/kg dry weight)</b>					
2,4'-DDD	EPA 8081B	0.20	1.0	---	---
2,4'-DDE	EPA 8081B	0.25	1.0	---	---
2,4'-DDT	EPA 8081B	0.19	1.0	---	---
4,4'-DDD	EPA 8081B	0.32	1.0	---	---
4,4'-DDE	EPA 8081B	0.14	1.0	---	---
4,4'-DDT	EPA 8081B	0.32	1.0	---	---
2,4'-DDD and 4,4'-DDD	Calculated	--	--	310	860
2,4'-DDE and 4,4'-DDE	Calculated	--	--	21	33
2,4'-DDT and 4,4'-DDT	Calculated	--	--	100	8100
beta-HCH	EPA 8081B	0.09	0.50	7.2	11
Dieldrin	EPA 8081B	0.12	1.0	4.9	9.3
Endrin ketone	EPA 8081B	0.28	1.0	8.5	---
<b>Polychlorinated Biphenyls (µg/kg dry weight)</b>					
Aroclor 1016	EPA 8082A	1.6	4.0	---	---
Aroclor 1221	EPA 8082A	1.6	4.0	---	---
Aroclor 1232	EPA 8082A	1.6	4.0	---	---
Aroclor 1242	EPA 8082A	1.6	4.0	---	---
Aroclor 1248	EPA 8082A	1.6	4.0	---	---
Aroclor 1254	EPA 8082A	1.6	4.0	---	---
Aroclor 1260	EPA 8082A	0.6	4.0	---	---
Total Aroclor PCBs (U = 0)	EPA 8082A	1.6	4.0	110	2500
<b>Total Petroleum Hydrocarbons (mg/kg dry weight)</b>					
Diesel range organics	NWTPHDx	2.3	5.0	340	510
Residual range organics	NWTPHDx	3.0	10	3600	4400

**Table A2-4**

**Parameters for Analysis, Screening Levels, Analytical Methods, and Target Quantitation Limits**

Parameter	Analytical Method	Method Detection Limit <sup>a</sup>	Quantitation Limit <sup>a</sup>	SMS Freshwater Sediment	
				Sediment Cleanup Objective	Cleanup Screening Level
<b>Dioxin/Furans (ng/kg dry weight)<sup>d</sup></b>					
<b>Dioxins</b>					
2,3,7,8-TCDD	EPA 1613B	0.15	1.0	---	---
1,2,3,7,8-PeCDD	EPA 1613B	0.17	1.0	---	---
1,2,3,4,7,8-HxCDD	EPA 1613B	0.17	1.0	---	---
1,2,3,6,7,8-HxCDD	EPA 1613B	0.18	1.0	---	---
1,2,3,7,8,9-HxCDD	EPA 1613B	0.22	1.0	---	---
1,2,3,4,6,7,8-HpCDD	EPA 1613B	0.56	2.5	---	---
OCDD	EPA 1613B	4.60	10	---	---
<b>Furans</b>					
2,3,7,8-TCDF	EPA 1613B	0.06	1.0	---	---
1,2,3,7,8-PeCDF	EPA 1613B	0.24	1.0	---	---
2,3,4,7,8-PeCDF	EPA 1613B	0.22	1.0	---	---
1,2,3,4,7,8-HxCDF	EPA 1613B	0.28	1.0	---	---
1,2,3,6,7,8-HxCDF	EPA 1613B	0.20	1.0	---	---
1,2,3,7,8,9-HxCDF	EPA 1613B	0.19	1.0	---	---
2,3,4,6,7,8-HxCDF	EPA 1613B	0.17	1.0	---	---
1,2,3,4,6,7,8-HpCDF	EPA 1613B	0.21	1.0	---	---
1,2,3,4,7,8,9-HpCDF	EPA 1613B	0.24	1.0	---	---
OCDF	EPA 1613B	1.10	2.5	---	---
<b>Perfluoroalkyl and Polyfluoroalkyl Substances (µg/kg)</b>					
Perfluorobutanesulfonic acid (PFBS)	EPA 1633 Draft	0.084	0.200	---	---
Perfluorobutanoic acid (PFBA)	EPA 1633 Draft	0.145	0.800	---	---
Perfluorodecanesulfonic acid (PFDS)	EPA 1633 Draft	0.109	0.200	---	---
Perfluorodecanoic acid (PFDA)	EPA 1633 Draft	0.0481	0.200	---	---
Perfluorododecanesulfonic acid (PFDoS)	EPA 1633 Draft	0.0805	0.200	---	---
Perfluorododecanoic acid (PFDoA)	EPA 1633 Draft	0.0577	0.200	---	---
Perfluoroheptanesulfonic acid (PFHpS)	EPA 1633 Draft	0.0737	0.200	---	---
Perfluoroheptanoic acid (PFHpA)	EPA 1633 Draft	0.0692	0.200	---	---
Perfluorohexanesulfonic acid (PFHxS)	EPA 1633 Draft	0.0880	0.200	---	---
Perfluorohexanoic acid (PFHxA)	EPA 1633 Draft	0.0754	0.200	---	---
Perfluorononanesulfonic acid (PFNS)	EPA 1633 Draft	0.0783	0.200	---	---
Perfluorononanoic acid (PFNA)	EPA 1633 Draft	0.0572	0.200	---	---
Perfluorooctanesulfonamide (PFOSA)	EPA 1633 Draft	0.0756	0.200	---	---
Perfluorooctanesulfonic acid (PFOS)	EPA 1633 Draft	0.103	0.200	---	---
Perfluorooctanoic acid (PFOA)	EPA 1633 Draft	0.144	0.200	---	---
Perfluoropentanesulfonic acid (PFPeS)	EPA 1633 Draft	0.054	0.200	---	---
Perfluoropentanoic acid (PFPeA)	EPA 1633 Draft	0.0765	0.400	---	---
Perfluorotetradecanoic acid (PFTeDA)	EPA 1633 Draft	0.0543	0.200	---	---
Perfluorotridecanoic acid (PFTTrDA)	EPA 1633 Draft	0.0431	0.200	---	---
Perfluoroundecanoic acid (PFUnA)	EPA 1633 Draft	0.0904	0.200	---	---
PFEESA	EPA 1633 Draft	0.114	0.400	---	---
PFMBA	EPA 1633 Draft	0.102	0.400	---	---
PFMPA	EPA 1633 Draft	0.108	0.400	---	---
11Cl-PF3OUdS	EPA 1633 Draft	0.181	0.800	---	---
3:3 FTCA	EPA 1633 Draft	0.230	1.00	---	---
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	EPA 1633 Draft	0.229	0.800	---	---
4:2 FTS	EPA 1633 Draft	0.308	0.750	---	---
5:3 FTCA	EPA 1633 Draft	1.44	5.000	---	---
6:2 FTS	EPA 1633 Draft	0.159	0.750	---	---
7:3 FTCA	EPA 1633 Draft	1.40	5.00	---	---
8:2 FTS	EPA 1633 Draft	0.361	0.750	---	---
9Cl-PF3ONS	EPA 1633 Draft	0.247	0.750	---	---
EtFOSA	EPA 1633 Draft	0.143	0.200	---	---
EtFOSAA	EPA 1633 Draft	0.0613	0.200	---	---
EtFOSE	EPA 1633 Draft	0.528	2.00	---	---
HFPO-DA (GenX)	EPA 1633 Draft	0.337	0.835	---	---
MeFOSA	EPA 1633 Draft	0.0906	0.200	---	---
MeFOSAA	EPA 1633 Draft	0.0797	0.200	---	---
MeFOSE	EPA 1633 Draft	0.590	2.00	---	---
NFDHA	EPA 1633 Draft	0.207	0.400	---	---

Notes:

---: not applicable

- a. Laboratory detection and reporting limits may vary based on laboratory selection and sample-specific analytical factors.
- b. Greater than (>) values indicate that the upper bound of toxicity level is unknown but is known to be above the concentration shown.
- c. Total PAHs consists of the sum of all PAHs listed.
- d. Dioxin/furan results will be reported to sample and analysis-specific estimated detection limits.

µg/kg: microgram per kilogram

ASTM: ASTM International

DDD: dichlorodiphenyldichloroethane

DDE: dichlorodiphenyldichloroethylene

DDT: dichlorodiphenyltrichloroethane

EPA: U.S. Environmental Protection Agency

mg/kg: milligram per kilogram

ng/kg: nanogram per kilogram

NWTPHDx: Northwest Total Petroleum Hydrocarbons diesel range

PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated biphenyl

PFAS: perfluoroalkyl and polyfluoroalkyl substances

PSEP: Puget Sound Estuary Program

SM: Standard Method

SMS: Sediment Management Standards

TEQ: toxicity equivalence

**Table A3-1  
Laboratory Quality Assurance/Quality Control Summary**

Parameter	Initial Calibration	Continuing Calibration	Field Duplicate	Laboratory Control Sample	Matrix Duplicate <sup>d</sup>	Matrix Spikes	Matrix Spike Duplicate <sup>d</sup>	Method Blanks	Surrogate Spikes
Grain size	Each batch <sup>a</sup>	NA	1 per up to 20 samples	NA	1 per up to 20 samples	NA	NA	NA	NA
Total solids/Total volatile solids	Each batch <sup>a</sup>	NA	1 per up to 20 samples	NA	1 per up to 20 samples	NA	NA	NA	NA
Total organic carbon	Daily or each batch	1 per 10 samples	1 per up to 20 samples	1 per up to 20 samples	1 per up to 20 samples	1 per up to 20 samples	NA	1 per up to 20 samples	NA
Ammonia	Each batch	1 per 10 samples	1 per up to 20 samples	1 per up to 20 samples	1 per up to 20 samples	1 per up to 20 samples	NA	1 per up to 20 samples	NA
Total sulfides	Each batch	1 per 10 samples	1 per up to 20 samples	1 per up to 20 samples	1 per up to 20 samples	1 per up to 20 samples	NA	1 per up to 20 samples	NA
Metals	Daily	1 per 10 samples	1 per up to 20 samples	1 per up to 20 samples	1 per up to 20 samples	1 per up to 20 samples	1 per up to 20 samples	1 per up to 20 samples	NA
SVOCs/PAHs	As needed <sup>b</sup>	Every 12 hours	1 per up to 20 samples	1 per up to 20 samples	1 per up to 20 samples	1 per up to 20 samples	1 per up to 20 samples	1 per up to 20 samples	Every sample
Pesticides	As needed <sup>b</sup>	1 per 10 samples <sup>c</sup>	1 per up to 20 samples	1 per up to 20 samples	1 per up to 20 samples	1 per up to 20 samples	1 per up to 20 samples	1 per up to 20 samples	Every sample
PCBs	As needed <sup>b</sup>	1 per 10 samples <sup>c</sup>	1 per up to 20 samples	1 per up to 20 samples	1 per up to 20 samples	1 per up to 20 samples	1 per up to 20 samples	1 per up to 20 samples	Every sample
TPH	As needed <sup>b</sup>	1 per 10 samples <sup>c</sup>	1 per up to 20 samples	1 per up to 20 samples	1 per up to 20 samples	1 per up to 20 samples	1 per up to 20 samples	1 per up to 20 samples	Every sample
Dioxins/furans	As needed <sup>b</sup>	Every 12 hours	1 per up to 20 samples	1 per up to 20 samples	1 per up to 20 samples	NA	NA	1 per up to 20 samples	Every sample <sup>e</sup>
PFAS	Annually or as needed <sup>b</sup>	1 per 10 samples <sup>c</sup>	1 per up to 20 samples	1 per up to 20 samples	1 per up to 20 samples	NA	NA	1 per up to 20 samples	Every sample <sup>e</sup>

## **Table A3-1**

### **Laboratory Quality Assurance/Quality Control Summary**

Notes:

- a. Calibration and certification of drying ovens and weighing scales are conducted biannually.
- b. Initial calibrations are considered valid until the continuing calibration no longer meets method specifications. At that point, a new initial calibration is analyzed.
- c. Continuing calibrations at the beginning and end of each batch and once for every 10 field samples analyzed.
- d. Matrix spike duplicates may be analyzed in place of matrix duplicates for analyses where matrix spikes are required. Matrix duplicates may be analyzed in place of matrix spike duplicates.
- e. Isotope dilution with labeled compounds required in every sample.

NA: not applicable

PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated biphenyl

PFAS: perfluoroalkyl and polyfluoroalkyl substances

SVOC: semivolatile organic compound

TPH: total petroleum hydrocarbons

**Table A3-2**  
**Data Quality Objectives**

Parameter	Precision	Accuracy	Surrogates	Completeness
Grain size	± 20% RSD	NA	NA	95%
Total solids/total volatile solids	± 20% RSD	NA	NA	95%
Total organic carbon	± 20% RSD	75%–125% R	NA	95%
Ammonia	± 20% RSD	75%–125% R	NA	95%
Total sulfides	± 20% RSD	75%–125% R	NA	95%
Total metals	± 20% RPD	75%–125% R	NA	95%
PAHs/SVOCs	± 35% RPD	50%–150% R	Laboratory limits	95%
Pesticides	± 35% RPD	50%–150% R	Laboratory limits	95%
PCBs	± 35% RPD	50%–150% R	Laboratory limits	95%
Total petroleum hydrocarbons	± 35% RPD	50%–150% R	Laboratory limits	95%
Dioxins/furans	± 30% RPD	50%–150% R	Laboratory limits	95%
PFAS	± 30% RPD	50%–150% R	Method limits	95%

Notes:

NA: not applicable

PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated biphenyl

PFAS: perfluoroalkyl and polyfluoroalkyl substances

R: recovery

RPD: relative percent difference

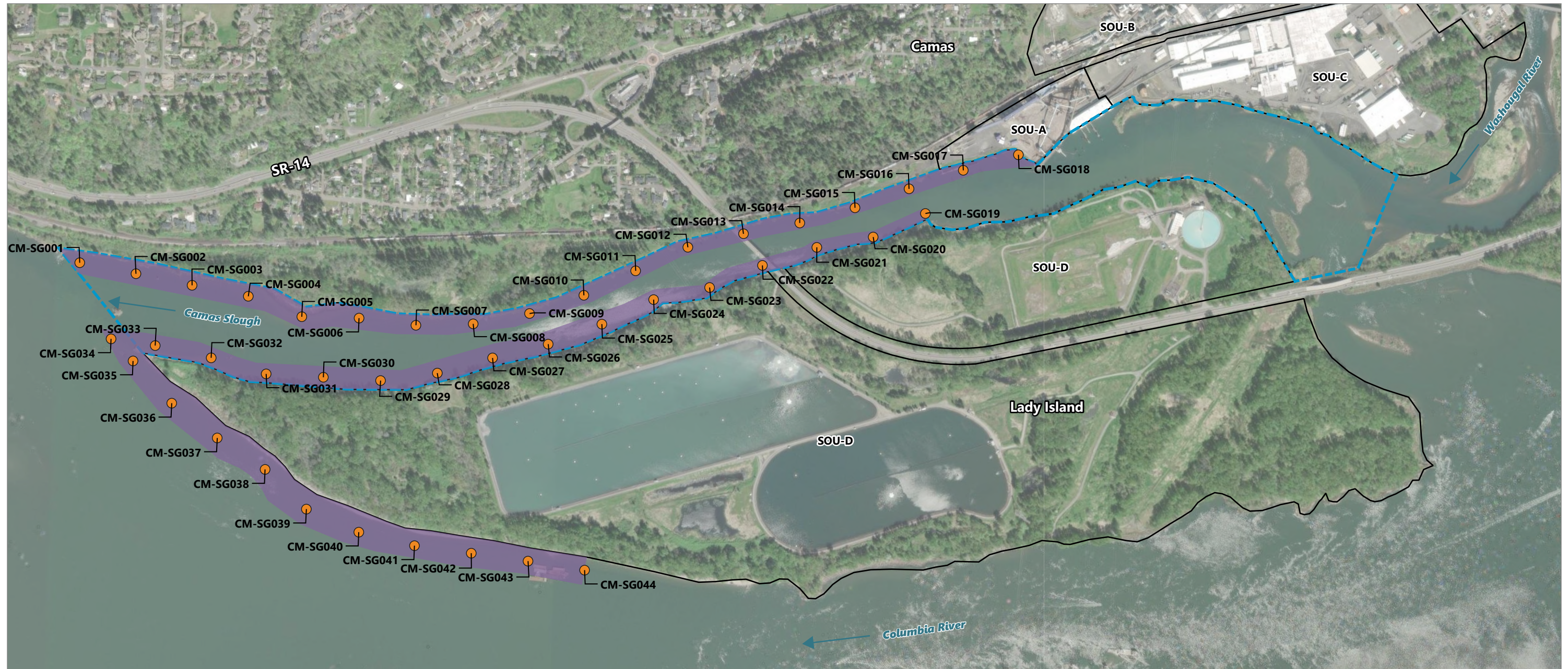
RSD: relative standard deviation

SVOC: semivolatile organic compound

## Figures

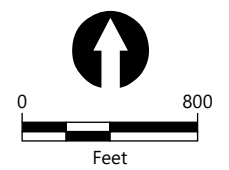
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- LEGEND:**
- Site Operational Unit
  - ▭ Camas Slough Study Area
  - ▭ Approximate Limits of Former Log Storage Area
  - Wood Debris Grab Sample Location

**NOTE:**  
1. Aerial imagery: Esri (2023)

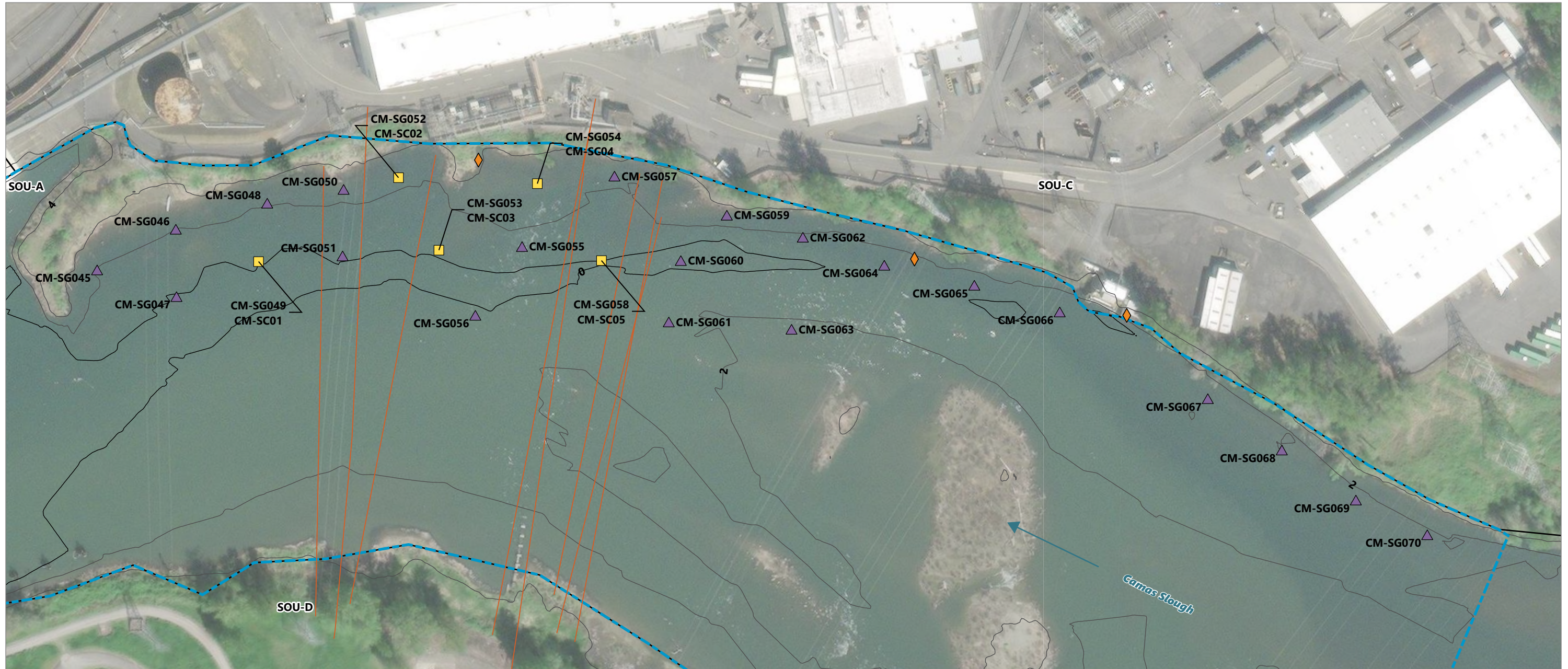


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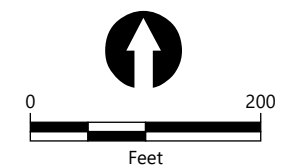
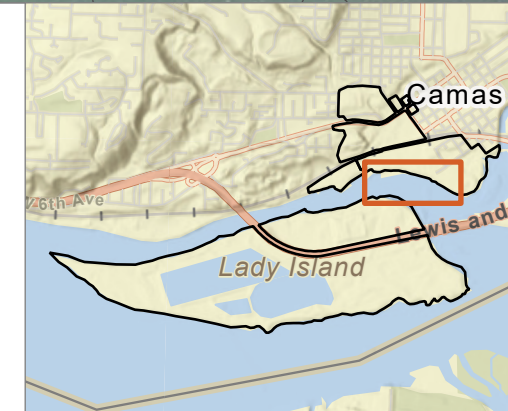
**Figure A2-1**  
**Proposed Wood Debris Grab Sampling Locations**  
Sediment Sampling and Quality Assurance Project Plan  
Georgia-Pacific LLC





- LEGEND:**
- Site Operational Unit
  - ▭ Camas Slough Study Area
  - 2-foot Contour (NAVD88)
  - 10-foot Contour (NAVD88)
  - Utility Crossing
  - ◇ Active Outfall
  - ▲ Sediment Grab Sample Location
  - Sediment Grab Sample and Subsurface Core Location

**NOTE:**  
1. Aerial imagery: Esri (2023)



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**Figure A2-2**  
**Phase I Proposed Sediment Sampling Locations**  
Sediment Sampling and Quality Assurance Project Plan  
Georgia-Pacific LLC



Attachment A1

Sediment PFAS Sampling Guidance

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# SEDIMENT PFAS SAMPLING

## Guidance

### Introduction

This sampling guidance discusses the processes, decontamination procedures, and acceptable materials for sampling sediment for Per- and Polyfluoroalkyl Substances (PFAS). The guidance will supplement the Michigan Department of Environmental Quality (MDEQ) Water Resources Division (WRD), *Sediment Sampling and Safety Procedures* (WRD-SWAS-011) and *Quality Assurance Manual for Water, Sediment, and Biological Sampling* (MDEQ, 1994) or other appropriate sediment Standard Operating Procedures, but will not replace them. In addition, this sampling guidance will be used to support the sampling objectives and procedures based on the Quality Assurance Project Plan (QAPP) developed prior to any field activities. This guidance assumes staff has basic familiarity with and/or understanding of basic sediment sampling procedures.

**NOTE:** Review the **General PFAS Sampling Guidance** prior to reviewing this guidance document.

The MDEQ intends to update the information contained within this PFAS Sampling Guidance document as new information becomes available. The user of this PFAS Sampling Guidance is encouraged to visit the Michigan PFAS Action Response Team webpage ([www.michigan.gov/PFASresponse](http://www.michigan.gov/PFASresponse)) to access the current version of this document.

Because PFAS compounds can be analyzed at concentrations in the parts per trillion (ppt) range, precautions must be taken to prevent cross-contamination. Field sampling equipment, either rented or not, that is used at multiple sites or sampling locations (also described as non-dedicated equipment), could become highly contaminated with PFAS. If site-specific information is available, sampling should be conducted from the least to the most contaminated locations. Additional guidance on the sampling sequence can be found in **Section 4.3.3** of the **General PFAS Sampling Guidance**.

Sediment sampling involves the use of non-dedicated equipment, such as scoops, trowels, shovels, augers, and other dredging or grab samplers, which could be a source of cross contamination. Decontamination procedures outlined in this guidance document should be followed to avoid cross contamination and equipment must be verified as PFAS-free.

The site-specific quality assurance document will generally provide the following information:

- Sample collection objectives.
- Locations, number, and volume of samples.
- Types of chemical analyses.
- Specific quality control procedures.
- Additional sampling requirements, as necessary.

This sediment sampling guidance document discusses the collection of sediment samples for PFAS and methods to prevent cross-contamination that can occur from:

- Field clothing and personal protection equipment (PPE).
- Sampling equipment.
- Equipment decontamination.
- Sample collection and handling.
- Sample shipment.

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**NOTE:** Additional information about PFAS testing can be found on the Michigan PFAS Action Response Team (MPART) website:  
[www.michigan.gov/PFASresponse](http://www.michigan.gov/PFASresponse)

## 1. Potential Sources for PFAS Cross-Contamination

Potential sources for PFAS cross-contamination include items and materials used within the sampling environment, such as sampling equipment, field clothing, personal protective equipment (PPE), sun and biological protection products, personal hygiene, personal care products (PCPs), and food packaging. A detailed discussion about potential sources for PFAS cross-contamination is included in the **General PFAS Sampling Guidance**, which should be reviewed before reading this document. However, a high-level summary is presented in this guidance.

All of the items and materials discussed in each of the MDEQ's PFAS Sampling Guidance Documents are divided into three major groups:

- Prohibited (●) identifies items and materials that should not be used when sampling. It is well documented that they contain PFAS or that PFAS are used in their manufacture.
- Allowable (■) identifies items and materials that have been proven not to be sources of PFAS cross contamination and are considered acceptable for sampling.
- Needs Screening (▲) identifies items and materials that have the potential for PFAS cross-contamination due to a lack of scientific data or statements from manufacturers to prove otherwise. These items and materials are further sub-divided into two categories:
  - **Category 1:** Items and materials that will come in direct contact with the sample. These should not be used when sampling unless they are known to be PFAS-free, by collecting an equipment blank sample prior to use.
  - **Category 2:** Items and materials that will not come in direct contact with the sample. These should be avoided, if possible, unless they are known to be PFAS-free by collecting an equipment blank sample prior to use.

Please note that at this time no published research is available that documents the use of various materials and effect on sample results. Therefore, a conservative approach is recommended, and the guidance is based on the collection of multiple environmental samples at various PFAS Sites. Sampling staff should take practical and appropriate precautions to avoid items that are likely to contain PFAS at the sampling site as well as avoid specific items during the sampling event.

A general overview of PFAS contamination sources during sampling can be found in **Section 4.2** of the **General PFAS Sampling Guidance**. Any items or materials utilized that are not identified in this guidance or not discussed in **Section 4.2** should be evaluated as described in **Section 4.2.1**.

Sampling staff should take practical and appropriate precautions to avoid items that are likely to contain PFAS at the sampling site as well as avoid specific items during the sampling event (see below).

### 1.1 Field Clothing and Personal Protection Equipment (PPE)

A general overview of field clothing and PPE can be found in **Section 4.2.2** from the **General PFAS Sampling Guidance**. Materials, field clothing, and equipment screening should be performed during the QAPP development or the planning phase of sampling programs. The screening should be performed on all items and materials that are expected to come into contact with the samples and are defined as **Category 1**. This Sediment Sampling Guidance assumes that the sediment samples will be collected in an environment where only Level D protection (such as

**NOTE:** Both field clothing and PPE should be kept dust and fiber free.

steel toe boots, eye protection, hardhat, etc.) is required by the Health and Safety Plan (HASP). During a PFAS investigation, PPE that contains PFAS should be avoided to prevent cross-contamination.

As with any field mobilization, it is the responsibility of all personnel to be aware of the physical, chemical, and biological hazards associated with a particular site. Personal safety is paramount. Any deviation from this guidance, including those necessary to ensure the health and safety of sampling personnel, should be recorded in field notes and discussed in the final report. Any additional field clothing and/or PPE items that might be required for the sediment sampling and not discussed in the Sampling Guidance should be evaluated as described in **Sections 4.2.1 and 4.2.2** of the **General PFAS Sampling Guidance**.

Field sampling during wet weather (e.g., rainfall and snow) should be conducted while wearing the proper field clothing.

- Dust and fibers must not be allowed to collect on field clothing or PPE.
- Do not use clothing that has been advertised as waterproof, dirt and/or stain repellent that has not been verified to be made of PFAS-free materials.
- Only use clothing/PPE that has been verified to be made of PFAS-free materials.

Powderless nitrile gloves should be changed frequently any time there is an opportunity for cross-contamination. See **Section 6** of this guidance for additional glove instructions.

### 1.2 Personal Care Products (PCPs)

A number of sampling guidance documents recommend that personal hygiene and personal care products (PCPs) (e.g., cosmetics, shampoo, sunscreens, dental floss, etc.) not be used prior to and on the day(s) of sampling because the presence of PFAS in these products has been documented (OECD, 2002, Fujii, 2013, Borg and Ivarsson, 2017). However, if the MDEQ's sampling SOPs are followed, these items should not come into contact with the sampling equipment or the sample being collected. As of the date of this sampling guidance, cross-contamination of samples due to the use of PCPs has not been documented during the collection of thousands of samples. However, field personnel should be aware of the potential of cross-contamination if the sampling equipment or actual samples would come into contact with these products.

The following precautions should be taken when dealing with personal hygiene or PCPs before sampling:

- Do not handle or apply PCPs in the sampling area.
- Do not handle or apply PCPs while wearing PPE that will be present during sampling.
- Move to the staging area and remove PPE if applying personal care products becomes necessary.
- Wash hands thoroughly after the handling or application of PCPs and, when finished, put on a fresh pair of powderless nitrile gloves.

### 1.3 Food Packaging

PFAS has been used by the paper industry as a special protective coating against grease, oil, and water for paper and paperboards, including food packaging since the late 1950s (Trier et al., 2018). PFAS application for food packaging includes paper products that come into contact with food such as paper plates, food containers, bags, and wraps (OECD, 2002). Pre-wrapped food or snacks (such as candy bars, microwave popcorn, etc.) must not be in the sampling and staging areas during

● - Prohibited    ■ – Allowable    ▲ - Needs Screening

sampling due to PFAS contamination of the packaging. When staff requires a break to eat or drink, they should remove their gloves, coveralls, and any other PPE, if worn, in the staging area and move to the designated area for food and beverage consumption. When finished, staff should wash their hands and put on a fresh pair of powderless nitrile gloves at the staging area, before returning to the sampling area.

- Do not handle, consume, or otherwise interact with pre-wrapped food or snacks, carry-out food, fast food, or other food items while on-site during sampling.
- Move to the staging area and remove PPE prior to leaving the sampling and staging areas if consuming food on site becomes necessary.

## 2. Sediment Sampling Equipment

Sediment sampling equipment is categorized into **Category 1** and **Category 2**:

**Category 1:** Any item that will directly come into contact with the sediment samples. This equipment has a high likelihood of cross-contamination occurring if the proper decontamination procedures are not followed. These items should be known to be PFAS-free. General sampling equipment that will come into contact with the sediment sample are:

**Note:** As a precautionary action, an equipment rinsate blank should be collected even if the sampling materials are made of materials that are not expected to contain PFAS.

- Shovels, trowels, spoons, and bowls.
- Hand augers, hand auger buckets, and extensions.
- Ponar<sup>®</sup> or Ekman<sup>®</sup> dredge samplers.
- Core sampler with a wire line.
- Stream sediment sampler.
- Van Veen<sup>®</sup> Grab Samplers and rope.
- Petite Ponar<sup>®</sup> grab sampler.
- Water depth recording device.
- Stainless-steel PushPoint<sup>®</sup> Sampler with guard rod.
- MHE Screen-Soks<sup>®</sup>.
- Three-way valve with Luer-Lok<sup>®</sup> type fitting.
- Syringes with Luer-Lok<sup>®</sup> type fitting.

**Category 2:** Any item that will not directly contact the sediment samples, including field books, Munsell<sup>®</sup> color charts, Post-It<sup>®</sup> Notes, aluminum foil, and recycled paper towels.

Although these items will not directly contact sediment samples, cross-contamination may still occur. Every effort should be made to ensure these items are PFAS-free. Be aware that surfaces of this field equipment or the containers in which they are kept may contain PFAS.

**Note:** Grease and/or tape used to assemble the sampling equipment could potentially contain PFAS. Pore water samples should be collected using similar sampling equipment described in the **Groundwater Sampling Guidance**.

In addition, if the field team is using canopy tents for shelter, the canopy material is likely to be a treated surface. Powderless nitrile gloves should be worn when setting up, dismantling, and moving the tent, changed immediately afterwards, and further contact with the tent should be avoided.

Do not use any equipment that contains any known fluoropolymers or that potentially has been cross-contamination with PFAS such as, but not limited to:

- - Prohibited
- - Allowable
- ▲ - Needs Screening

- Do not use Polytetrafluoroethylene (PTFE) that includes the trademark Teflon® and Hostaflon®, which can be found in many items, including but not limited to the lining of some hoses and tubing, some wiring, certain kinds of gears, and some objects that require the sliding action of parts.
- Do not use Polyvinylidene fluoride (PVDF) that includes the trademark Kynar®, which can be found in many items, including but not limited to tubing, films/coatings on aluminum, galvanized or aluminized steel, wire insulators, and lithium-ion batteries.
- Do not use Polychlorotrifluoroethylene (PCTFE), that includes the trademark Neoflon®, which can be found in many items, including but not limited to valves, seals, gaskets, and food packaging.
- Do not use Ethylene-tetrafluoro-ethylene (ETFE) that includes the trademark Tefzel®, which can be found in many items, including but not limited to wire and cable insulation and covers, films for roofing and siding, liners in pipes, and some cable tie wraps.
- Do not use Fluorinated ethylene propylene (FEP), that includes the trademarks Teflon® FEP and Hostaflon® FEP, and may also include Neoflon®, which can be found in many items, including but not limited to wire and cable insulation and covers, pipe linings, and some labware.
- Do not use low density polyethylene (LDPE) for any items that will come into **direct contact** with the sample media. LDPE can be found in many items, including but not limited to containers and bottles, plastic bags, and tubing.
  - ▲ **However**, LDPE may be used if an equipment blank has confirmed it to be PFAS-free. LDPE does not contain PFAS in the raw material but may contain PFAS cross-contamination from the manufacturing process.
- LDPE bags (e.g. Ziploc®) that **do not** come into direct contact with the sample media and do not introduce cross-contamination with samples may be used.
- Use items and materials that are either made of high density polyethylene (HDPE), polypropylene, silicone, or acetate.
- ▲ Post-It® Notes should be screened before use.

**NOTE:** Manufacturers can change the chemical composition of any product. As a result, all materials that will come into contact with the sample matrices (defined as Category 1) should be tested to confirm they are “PFAS-free”, i.e. will not contaminate samples at detectable levels. **There is no guarantee that materials in the ‘Allowable’ category will always be PFAS-free.**

**NOTE:** Special care and consideration should be given to the field sampling equipment when stored and handled outside the site boundaries or between different sample locations.

### 3. Sediment Sampling Methods

Sediments are usually sampled to define the subsurface geology (lithology), or to determine the presence or absence of contaminants—in this case, PFAS (chemical analysis).

#### 3.1 Sediment Sampling for Lithologic Description

Sediment samples are collected to determine the lithologic and physical makeup of the sample (i.e.: clay, sand, gravel, brown, mottled, etc.). This is done to determine the subsurface geologic stratigraphy of the site. Sediments can be collected loose or cored.

##### 3.1.1 Loose Sediment Samples

A loose sediment sample is usually obtained by ponar or dredging processes, where the process delivers loose sediment to the surface for collection and interpretation. The sediments can be collected using a trowel or shovel and bagged in LDPE bags (e.g. Ziploc) or piled for later lithologic analysis and entry into a geologic log.



### 3.1.2 Cored Sediment Samples

A cored sediment sample is collected with a coring type of mechanism in a way that preserves the sediment structure. Most coring mechanisms consist of a steel core barrel with a clear plastic liner (use an acetate or other PFAS-free liner) into which the sediment core enters. Once the core barrel is retrieved at the surface, this liner is removed and cut open. The sediment core is then sliced open to reveal a clean face. This clean face is examined for lithology and structure.

### 3.2 Sediment Sampling for Chemical Analysis

Sediments collected for chemical analysis are usually collected by using the core sediment sample method. The sediment samples should be as undisturbed as possible.

During the sediment sampling process, the sediment sampling device is removed from the ground. The liner is removed and placed on the cutting board and opened using a liner cutting device. The sediment sample is visually inspected, and observations recorded in the site field book. The core is cut open to reveal a "clean" face for sampling. This process avoids the possibility of picking up any contaminants that may have gotten smeared onto the sediment surface as the sediment core entered the liner.

## 4. Equipment Decontamination

It is customary with sediment sampling that the equipment is decontaminated at the conclusion of the sampling event. If the previous user of the equipment is not known, and it is unclear how the equipment was handled—especially rental equipment—decontaminate the equipment prior to sampling.

Disposable **Category 1** sampling equipment should be used, especially for sample bottles and other materials that are used where the sediment sample may be in contact with the sampling equipment for an extended period of time. Field sampling equipment, either rented or not, that are used at multiple sites or sampling locations, may become contaminated with PFAS. Decontamination procedures must be implemented to prevent cross-contamination, including between individual sample locations. If site-specific information is available, sampling should be conducted from the least to the most contaminated locations. Additional guidance on the sampling sequence can be found in **Section 4.3.3** of the **General PFAS Sampling Guidance**.

For non-dedicated **Category 1** sampling equipment, the following items, materials, and procedures should be used for decontamination:

- Do not use Decon 90®.
- Laboratory supplied PFAS-free deionized water is preferred for decontamination.
- Alconox®, Liquinox®, and Citranox® can be used for equipment decontamination.
- Sampling equipment can be scrubbed using a polyethylene or Polyvinyl chloride (PVC) brush to remove particulates.
- Decontamination procedures should include triple rinsing with PFAS-free water.
- Commercially available deionized water in an HDPE container may be used for decontamination if the water is verified to be PFAS-free.
- ▲ Municipal drinking water may be used for decontamination purposes if it is known to be PFAS-free.



## 5. Sample Collection and Handling

The following considerations should be observed for sample collection:

- Dust and fibers must be kept out of sample bottles.
- The sample cap should never be placed directly on the ground during sampling.
  - ▲ If sampling staff must set the sample bottle cap down during sample collection and a second member of the sampling crew (wearing a fresh pair of powderless nitrile gloves) is not available, set the cap on a clean surface (cotton sheeting, HDPE sheeting, triple rinsed cooler lid, etc.).
- Do not sample without powderless nitrile gloves.
- Regular size Sharpie® are to be avoided. Thicker markers may contain PFAS.
- Fine and Ultra-Fine point Sharpie® markers are acceptable.
- Ballpoint pens may be used when labeling sample containers. If ballpoint pens do not write on the sample container labels, preprinted labels from the laboratory may be used.
- Bottles should only be opened immediately prior to sampling.
- Hands should be well washed and gloved.
- Use HDPE, glass, or polypropylene sample bottles with Teflon®-free caps, provided by the laboratory.
- Glass bottles or containers may be used if they are known to be PFAS-free, however, PFAS have been found to adsorb to glass, especially when the sample is in contact with the glass for a long period of time (e.g. being stored in a glass container). If the sample comes into direct contact with the glass for a short period of time (e.g. using a glass container to collect the sample, then transferring the sample to a non-glass sample bottle), the adsorption is minimal.
- Commercially bought sample bottles used with automatic sampling equipment should be decontaminated prior to sampling and equipment blank samples should be collected using laboratory supplied PFAS-free water.
- Samples should be double bagged using resealable low density polyethelene (LDPE) bags (e.g., Ziploc®).
- Follow any guidance or requirements in the PFAS analytical reference method that will be used for testing samples, for sample collection, storage, preservation, and holding times.
- If a published testing method is not used, and in the absence of formal United States Environmental Protection Agency (USEPA) guidance for PFAS sample storage, the documentation in USEPA Method 537 Rev. 1.1 should be used as a guide for thermal preservation (holding temperature) and holding times for soil or other samples. Samples must be chilled during storage and shipment and must not exceed 50°F (10° C) during the first 48 hours after collection.
- ▲ Latex gloves should be screened before use.

**NOTE:** USEPA Method 537 Rev. 1.1 was developed for the analysis of finished drinking water samples only. It was not designed for soils or other matrices that could cause significant interferences to the method. Other analytical methods such as ASTM D7968-14 or D7968-17a may be better at resolving interferences in soil samples. These methods were developed specifically for other matrices such as soil and sediments.

If site-specific information is available, sampling should be conducted from the least to the most contaminated location. Additional guidance on the sampling sequence can be found in **Section 4.3.3** of the **General PFAS Sampling Guidance**.

If possible, collect PFAS samples prior to collecting non-PFAS samples or field parameters (pH, temperature, etc.).

Powderless nitrile gloves must be changed any time there is an opportunity for cross-contamination during sampling, including, but not limited to:

- Immediately prior to sample collection
- Each time sampling equipment is placed in and then removed from sediment at a new location
- Handling of any sample, including quality assurance/quality control (QA/QC) samples
- After the handling of any non-dedicated sampling equipment
- After contact with non-decontaminated surfaces
- After decontamination of sampling equipment
- When judged necessary by field personnel

## 6. Sample Shipment

The following procedures should be used for sample shipment:

- Regular ice should be used to cool and maintain the sample at or below 42.8°F (6°C).
  - ▲ Chemical or blue ice may be used if it is known to be PFAS-free and it is absolutely certain that the sample is cooled and maintained at or below 42.8°F (6°C) during collection and through transit to the laboratory.
- Check the cooler periodically to ensure samples are well iced and at the proper temperature.
- Refresh with regular ice, if needed, double bagged in LDPE resealable storage bags if needed.
- Chain of Custody and other forms should be single bagged in LDPE (e.g. Ziploc®) storage bags and taped to the inside of the cooler lid.
- The cooler should be taped closed with a custody seal and shipped by overnight courier.
- Samples should be shipped as soon as possible (e.g. overnight) to ensure the samples arrive within the analytical holding time specified by the lab.

## 7. Equipment Decontamination After Sampling

It is customary to decontaminate sediment sampling equipment at the end of the sampling event, whether it is a single sampling location or the conclusion of the workday. This is to ensure sampling equipment is decontaminated ahead of time for the next sampling event.

- Do not put equipment away without decontaminating it.
- Do decontaminate sampling equipment after sampling at each location, or at the end of the workday. Follow the decontamination guidelines in **Section 4 Equipment Decontamination** of this document.

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# MDEQ PFAS SAMPLING QUICK REFERENCE FIELD GUIDE<sup>1</sup>

## All Items Used During Sampling Event

● Prohibited
<ul style="list-style-type: none"> <li>Items or materials that contain fluoropolymers such as                             <ul style="list-style-type: none"> <li>Polytetrafluoroethylene (PTFE), that includes the trademarks Teflon® and Hostaflon®</li> <li>Polyvinylidene fluoride (PVDF), that includes the trademark Kynar®</li> <li>Polychlorotrifluoroethylene (PCTFE), that includes the trademark Neoflon®</li> <li>Ethylene-tetrafluoro-ethylene (ETFE), that includes the trademark Tefzel®</li> <li>Fluorinated ethylene propylene (FEP), that includes the trademarks Teflon® FEP and Hostaflon® FEP</li> </ul> </li> <li>Items or materials that contain any other fluoropolymer</li> </ul>

## Pumps, Tubing, and Sampling Equipment

● Prohibited	■ Allowable	▲ Needs Screening <sup>2</sup>
<ul style="list-style-type: none"> <li>Items or materials containing any fluoropolymer (potential items include tubing, valves, or pipe thread seal tape)</li> </ul>	<ul style="list-style-type: none"> <li>High-density polyethylene (HDPE)</li> <li>Low-density polyethylene (LDPE) tubing</li> <li>Polypropylene</li> <li>Silicone</li> <li>Stainless-steel</li> <li>Any items used to secure sampling bottles made from:                             <ul style="list-style-type: none"> <li>Natural rubber</li> <li>Nylon (cable ties)</li> <li>Uncoated metal springs</li> <li>Polyethylene</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Any items or materials that will come into direct contact with the sample that have <b>not</b> been verified to be PFAS-free                             <ul style="list-style-type: none"> <li>Do not assume that any sampling items or materials are PFAS-free based on composition alone</li> </ul> </li> </ul>

## Sample Storage and Preservation

● Prohibited	■ Allowable	▲ Needs Screening <sup>2</sup>
<ul style="list-style-type: none"> <li>Polytetrafluoroethylene (PTFE): Teflon® lined bottles or caps</li> </ul>	<ul style="list-style-type: none"> <li>Glass jars<sup>4</sup></li> <li>Laboratory-provided PFAS-Free bottles:                             <ul style="list-style-type: none"> <li>HDPE or polypropylene</li> </ul> </li> <li>Regular wet ice</li> <li>Thin HDPE sheeting</li> <li>LDPE resealable storage bags (i.e. Ziploc®) that will not contact the sample media<sup>6</sup></li> </ul>	<ul style="list-style-type: none"> <li>Aluminium foil<sup>4</sup></li> <li>Chemical or blue ice<sup>5</sup></li> <li>Plastic storage bags other than those listed as ■ Allowable</li> <li>Low-density polyethylene (LDPE) bottles</li> </ul>

## Field Documentation

● Prohibited	■ Allowable	▲ Needs Screening <sup>2</sup>
<ul style="list-style-type: none"> <li>Clipboards coated with PFAS</li> <li>Notebooks made with PFAS treated paper</li> <li>PFAS treated loose paper</li> <li>PFAS treated adhesive paper products</li> </ul>	<ul style="list-style-type: none"> <li>Loose paper (non-waterproof, non-recycled)</li> <li>Rite in the Rain® notebooks</li> <li>Aluminium, polypropylene, or Masonite field clipboards</li> <li>Ballpoint pens, pencils, and Fine or Ultra-Fine Point Sharpie® markers</li> </ul>	<ul style="list-style-type: none"> <li>Plastic clipboards, binders, or spiral hard cover notebooks</li> <li>All markers not listed as ■ Allowable</li> <li>Post-It® Notes or other adhesive paper products</li> <li>Waterproof field books</li> </ul>

## Decontamination

● Prohibited	■ Allowable	▲ Needs Screening <sup>2</sup>
<ul style="list-style-type: none"> <li>Decon 90®</li> <li>PFAS treated paper towel</li> </ul>	<ul style="list-style-type: none"> <li>Alconox®, Liquinox®, or Citranox®</li> <li>Triple rinse with PFAS-free deionized water</li> <li>Cotton cloth or untreated paper towel</li> </ul>	<ul style="list-style-type: none"> <li>Municipal water</li> <li>Recycled paper towels or chemically treated paper towels</li> </ul>

## Clothing, Boots, Rain Gear, and PPE

● Prohibited	■ Allowable	▲ Needs Screening <sup>2</sup>
<ul style="list-style-type: none"> <li>• New or unwashed clothing</li> <li>• Anything made of or with:               <ul style="list-style-type: none"> <li>○ Gore-Tex™ or other water-resistant synthetics</li> </ul> </li> <li>• Anything applied with or recently washed with:               <ul style="list-style-type: none"> <li>○ Fabric softeners</li> <li>○ Fabric protectors, including UV protection</li> <li>○ Insect resistant chemicals</li> <li>○ Water, dirt, and/or stain resistant chemicals</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Powderless nitrile gloves</li> <li>• Well-laundered synthetic or 100% cotton clothing, with most recent launderings not using fabric softeners</li> <li>• Made of or with:               <ul style="list-style-type: none"> <li>○ Polyurethane</li> <li>○ Polyvinyl chloride (PVC)</li> <li>○ Wax coated fabrics</li> <li>○ Rubber / Neoprene</li> <li>○ Uncoated Tyvek®</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Latex gloves</li> <li>• Water and/or dirt resistant leather gloves</li> <li>• Any special gloves required by a HASP</li> <li>• Tyvek® suits, clothing that contains Tyvek®, or coated Tyvek®</li> </ul>

## Food and Beverages

● Prohibited	■ Allowable
<ul style="list-style-type: none"> <li>• No food should be consumed in the staging or sampling areas, including pre-packaged food or snacks.               <ul style="list-style-type: none"> <li>■ If consuming food on-site becomes necessary, move to the staging area and remove PPE. After eating, wash hands thoroughly and put on new PPE.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Brought and consumed only outside the vicinity of the sampling area:               <ul style="list-style-type: none"> <li>○ Bottled water</li> <li>○ Hydration drinks (i.e. Gatorade®, Powerade®)</li> </ul> </li> </ul>

## Personal Care Products (PCPs) - for day of sample collection<sup>6</sup>

● Prohibited	■ Allowable	▲ Needs Screening <sup>2</sup>
<ul style="list-style-type: none"> <li>• Any PCPs<sup>6</sup>, sunscreen, and insect repellent applied in the sampling area.</li> </ul>	<p>PCPs<sup>6</sup>, sunscreens, and insect repellents applied in the staging area, away from sampling bottles and equipment followed by thoroughly washing hands:</p> <p><b>PCPs<sup>6</sup>:</b></p> <ul style="list-style-type: none"> <li>• Cosmetics, deodorants/antiperspirants, moisturizers, hand creams, and other PCPs<sup>6</sup></li> </ul> <p><b>Sunscreens:</b></p> <ul style="list-style-type: none"> <li>• Banana Boat® for Men Triple Defense Continuous Spray Sunscreen SPF 30</li> <li>• Banana Boat® Sport Performance Coolzone Broad Spectrum SPF 30</li> <li>• Banana Boat® Sport Performance Sunscreen Lotion Broad Spectrum SPF 30</li> <li>• Banana Boat® Sport Performance Sunscreen Stick SPF 50</li> <li>• Coppertone® Sunscreen Lotion Ultra Guard Broad Spectrum SPF 50</li> <li>• Coppertone® Sport High Performance AccuSpray Sunscreen SPF 30</li> <li>• Coppertone® Sunscreen Stick Kids SPF 55</li> <li>• L'Oréal® Silky Sheer Face Lotion 50</li> <li>• Meijer® Clear Zinc Sunscreen Lotion Broad Spectrum SPF 50</li> <li>• Meijer® Sunscreen Continuous Spray Broad Spectrum SPF 30</li> <li>• Meijer® Clear Zinc Sunscreen Lotion Broad Spectrum SPF 15, 30 and 50</li> <li>• Meijer® Wet Skin Kids Sunscreen Continuous Spray Broad Spectrum SPF 70</li> <li>• Neutrogena® Beach Defense Water+Sun Barrier Lotion SPF 70</li> <li>• Neutrogena® Beach Defense Water+Sun Barrier Spray Broad Spectrum SPF 30</li> <li>• Neutrogena® Pure &amp; Free Baby Sunscreen Broad Spectrum SPF 60+</li> <li>• Neutrogena® UltraSheer Dry-Touch Sunscreen Broad Spectrum SPF 30</li> </ul> <p><b>Insect Repellents:</b></p> <ul style="list-style-type: none"> <li>• OFF® Deep Woods</li> <li>• Sawyer® Permethrin</li> </ul>	<ul style="list-style-type: none"> <li>• Products other than those listed as               <ul style="list-style-type: none"> <li>■ Allowable</li> </ul> </li> </ul>

<sup>1</sup> This table is not considered to be a complete listing of prohibited or allowable materials. All materials should be evaluated prior to use during sampling. The manufacturers of various products should be contacted in order to determine if PFAS was used in the production of any particular product.

<sup>2</sup> Equipment blank samples should be taken to verify these products are PFAS-free prior to use during sampling.

<sup>3</sup> **For surface water foam samples:** LDPE storage bags may be used in the sampling of foam on surface waters. In this instance, it is allowable for the LDPE bag to come into direct contact with the sample media.

<sup>4</sup> **For fish and other wildlife samples:** Depending on the project objectives, glass jars and aluminum foil might be used for PFAS sampling. PFAS has been found to bind to glass and if the sample is stored in a glass jar, a rinse of the jar is required during the sample analysis. PFAS are sometimes used as a protective layer for some aluminum foils. An equipment blank sample should be collected prior to any aluminum foil use.

<sup>5</sup> Regular ice is recommended as there are concerns that chemical and blue ice may not cool and maintain the sample at or below 42.8°F (6°C) (as determined by EPA 40 CFR 136 – NPDES) during collection and through transit to the laboratory.

<sup>6</sup> Based on evidence, avoidance of PCPs is considered to be precautionary because none have been documented as having cross-contaminated samples due to their use. However, if used, application of PCPs must be done at the staging area and away from sampling bottles and equipment, and hands must be thoroughly washed after the use of any PCPs prior to sampling.

Attachment A2

Field Forms

---





# Sediment Core Collection Log

Job: \_\_\_\_\_  
 Job No: \_\_\_\_\_  
 Field Staff: \_\_\_\_\_  
 Contractor: \_\_\_\_\_  
 Vertical Datum: \_\_\_\_\_

Station ID: \_\_\_\_\_  
 Attempt No. \_\_\_\_\_  
 Date: \_\_\_\_\_  
 Logged By: \_\_\_\_\_  
 Horizontal Datum: \_\_\_\_\_

### Field Collection Coordinates:

Lat/Northing: \_\_\_\_\_

Long/Easting: \_\_\_\_\_

### A. Water Depth

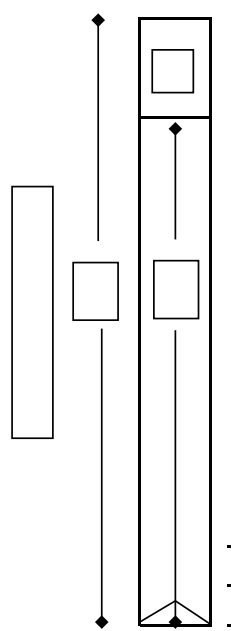
DTM Depth Sounder: \_\_\_\_\_  
 DTM Lead Line: \_\_\_\_\_

### B. Water Level Measurements

Time: \_\_\_\_\_  
 Tide Height: \_\_\_\_\_  
 Source: \_\_\_\_\_

### C. Mudline Elevation

Recovery Measurements (prior to cuts)



### Sections To Process:

A: \_\_\_\_\_  
 B: \_\_\_\_\_  
 C: \_\_\_\_\_  
 D: \_\_\_\_\_

### Core Collection Recovery Details:

Core Accepted: Yes / No  
 Core Tube Length: \_\_\_\_\_  
 Drive Penetration: \_\_\_\_\_  
 Headspace Measurement: \_\_\_\_\_  
 Recovery Measurement: \_\_\_\_\_  
 Recovery Percentage: \_\_\_\_\_  
 Total Length of Core To Process: \_\_\_\_\_

### Drive Notes:

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

### Core Field Observations and Description:

Sediment type, moisture, color, minor modifier, MAJOR modifier, other constituents, odor, sheen, layering, anoxic layer, debris, plant matter, shells, biota

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

### Notes:

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



# Sediment Core Processing Log



Job: \_\_\_\_\_  
 Job No. \_\_\_\_\_  
 No. of Sections: \_\_\_\_\_  
 Drive Length: \_\_\_\_\_  
 Recovery: \_\_\_\_\_  
 % Recovery: \_\_\_\_\_  
 Notes: \_\_\_\_\_

Station ID: \_\_\_\_\_  
 Date/Time: \_\_\_\_\_  
 Core Logged By: \_\_\_\_\_  
 Attempt #: \_\_\_\_\_  
 Type of Core  Mudmole  Vibracore  Diver Core  
 Diameter of Core (inches) \_\_\_\_\_  
 Core Quality  Good  Fair  Poor  Disturbed

Recovered Length (ft)	Size % Gravel	Size % Sand	Size % Fines	<b>Classification and Remarks</b> (Density, Moisture, Color, Minor Constituent, MAJOR Constituent, with Additional Constituents, Sheen, Odor)	Recovered Length (ft)	PID	Sample	Summary Sketch



# Appendix B

## Health and Safety Plan

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DRAFT

November 2023  
Camas Mill Sediment Remedial Investigation



# Health and Safety Plan

Prepared for Georgia-Pacific Consumer Operations LLC



DRAFT

November 2023  
Camas Mill Sediment Remedial Investigation Work Plan

# Health and Safety Plan

**Prepared for**  
Georgia-Pacific Consumer Operations LLC  
401 Northeast Adams Street  
Camas, Washington 98607

**Prepared by**  
Anchor QEA, LLC  
6720 South Macadam Avenue, Suite 300  
Portland, Oregon 97219

## Certification Page

---

Rebecca Desrosiers, PE  
Project Manager  
Anchor QEA, LLC

Date: **Date TBD**

---

---

Sasha Norwood  
Field Lead  
Anchor QEA, LLC

Date: **Date TBD**

---

The information in this Health and Safety Plan has been designed for the Camas Mill Sediment Remedial Investigation Work Plan 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.







# Site Emergency Procedures

## Site Map

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



## Emergency Contact Information

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

Category	Information
Possible Chemicals of Concern	PCBs, TPH, Per- and Polyfluoroalkyl Substances (PFAS), dioxins, PAHs, metals (Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Selenium, Silver, Sodium, Thallium, Vanadium, Zinc, and Mercury)
Minimum Level of Protection	Modified Level D
Site(s) Location Address	401 Northeast Adams Street, Camas, Washington 98607
<b>Emergency Phone Numbers</b>	
Ambulance	911
Fire	911
Police	911
Poison Control	(800) 222-1222
Client Contact	Matt Tiller Office: (404) 216-6674
Project Manager (PM)	Rebecca Desrosiers Office: (206) 903-3332 Cell: (206) 669-7333
Field Lead (FL)	Sasha Norwood Office: (503) 924-6194 Cell: (503) 545-5138

Category	Information
Director of Health and Safety (DOHS)	Tim Shaner Office: (251) 375-5282 Cell: (251) 281-3386
State Emergency Response System – Washington Emergency Management Division	(800) 258-5990
EPA Emergency Response Team, <sup>1</sup> Region 10	(206) 553-1200

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.

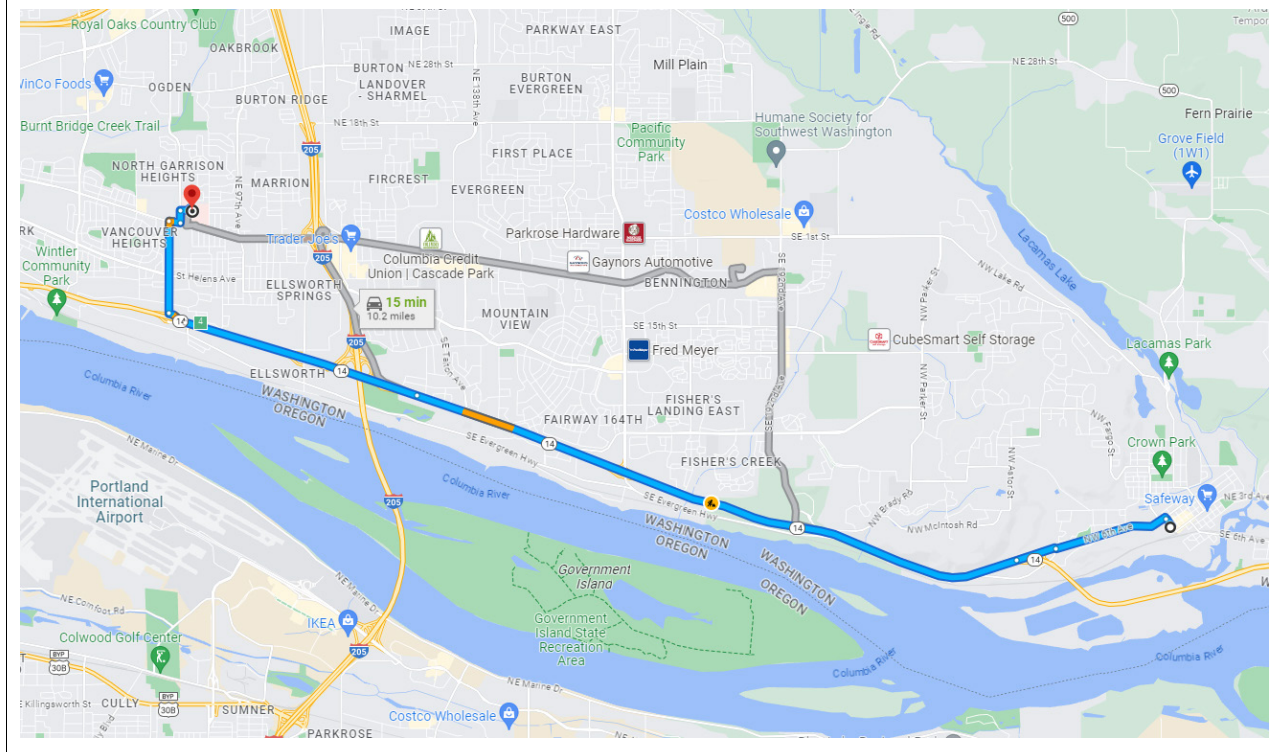
**Table B  
Hospital Information**

Category	Information
Hospital Name	PeaceHealth Southwest Medical Center
Address	400 Northeast Mother Joseph Place
City, State	Vancouver, Washington
Phone	(360) 514-2000
Emergency Phone	(360) 514-2000

## Hospital Route Map and Driving Directions

1. Head northwest on Northeast Adams Street toward Northeast 5th Avenue (427 feet).
2. Turn left on Northeast 6th Avenue (1.0 mile).
3. At the traffic circle, continue straight onto the WA-14 ramp (0.4 mile).
4. Merge onto WA-14 West (5.5 miles).
5. Keep left to stay on WA-14 West (2.1 miles).
6. Take Exit 4 from WA-14 West for Lieser Road toward Southeast 88th Avenue (0.2 mile).
7. Turn right onto South Lieser Road (0.8 mile).
8. Turn right onto East Mill Plain Boulevard (0.1 mile).
9. Use the second from the left lane to turn left onto Northeast 87th Avenue (0.1 mile).
10. Turn right toward Northeast Mother Joseph Place (361 feet).
11. Turn left onto Northeast Mother Joseph Place (141 feet).
12. Turn right and arrive at PeaceHealth Southwest Medical Center.

**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: Matt Tiller	Office: (404) 216-6674
Project Manager (PM): Rebecca Desrosiers	Office: (206) 903-3332 Cell: (206) 669-7333
Field Lead (FL): Sasha Norwood	Office: (503) 924-6194 Cell: (503) 545-5138
Director of Director of Health and Safety (DOHS): Tim Shaner	Office: (251) 375-5282 Cell: (251) 281-3386

## Personal Incident Response Procedures

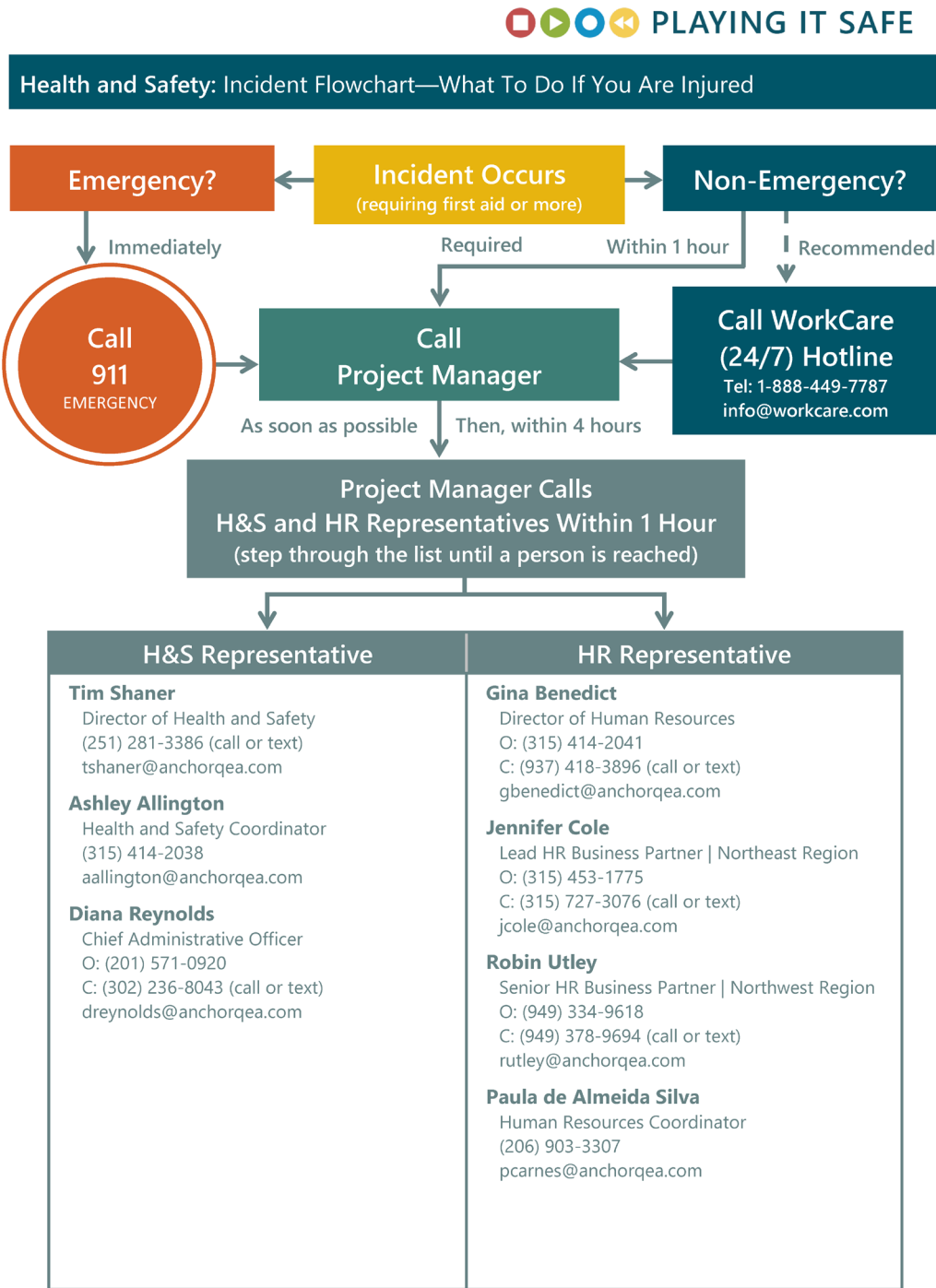
In the event of an emergency, immediate action must be taken by the first person to recognize the event. Use the following steps as a guideline and refer to Figure C:

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

--	not applicable
AED	Automated External Defibrillator
ANSI	American National Standards Institute
APR	air-purifying respirator
ASTM	ASTM International
CAS	Chemical Abstracts Service
CDC	Centers for Disease Control and Prevention
CFR	<i>Code of Federal Regulations</i>
COPC	chemical of potential concern
CPR	cardiopulmonary resuscitation
CRZ	Contamination Reduction Zone
dba	A-weighted decibel
dB	decibel
DOHS	Director of Health and Safety
DOT	U.S. Department of Transportation
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
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	part 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
USCG	U.S. Coast Guard
UV	ultraviolet
VOC	volatile organic compound
WBGT	wet bulb globe temperature

# 1 Introduction

This Health and Safety Plan (HASP) was prepared on behalf of Georgia-Pacific Consumer Operations LLC (GP) 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 in-water work activities in the Camas Slough and Columbia River adjacent to the Camas Mill (the site). This HASP was developed in accordance with Title 29 *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 Attachment B-1. 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 GP Camas Mill is located at 401 Northeast Adams Street in Camas, Washington, along the Camas Slough and Columbia River. The upland site occupies approximately 661 acres, which includes 476 acres on Lady Island and 185 acres upland of the Camas Slough. The upland property is bordered by the Washougal River to the east, which flows south to its confluence with the Camas Slough. The south of the site is bordered by the Camas Slough and Columbia River; the Camas Slough separates the main mill area from Lady Island. A residential area is located to the west, and the downtown City of Camas is bordered to the north. The Study Area includes in-water work in portions of the Camas Slough and along the southern shore of Lady Island within the Columbia River.

### 2.2 Site Background Information

The purpose of the sediment remedial investigation is to collect, develop, and evaluate sufficient information to adequately characterize the Study Area for the purpose of developing a final conceptual site model and evaluating potential cleanup action alternatives. Remedial investigation activities are to be completed in accordance with Agreed Order (AO) No. DE 18201, completed between GP and Ecology and dated August 12, 2021. The upland remedial activities are led by Kennedy Jenks Consultants, Inc. (Kennedy Jenks) under separate cover. This HASP covers the in-water portion of remedial investigation activities in the Camas Slough and in the Columbia River adjacent to Lady Island.



## 3 Scope of Work

### 3.1 Project Scope of Work

Anchor QEA will oversee in-water remedial investigation activities in the Camas Slough and along the southern shore of Lady Island within the Columbia River.

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

- Completion of bathymetry survey and side-scan sonar
- Completion of remote in-water video surveys
- Completion of aerial drone surveys
- Collection and characterization of surface and subsurface sediment samples
- Collection of water quality samples (surface water and porewater)

## 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 Remedial Investigation Work Plan, 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 Director regarding unsafe conditions, incidents, or changes in site conditions or the Remedial Investigation Work Plan

### 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 Remedial Investigation Work Plan 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 Remedial Investigation Work Plan
- 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 (Attachment B-1).

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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 Sediment Remedial Investigation Work Plan and the chemicals of potential concern (COPCs) in sediment.

### 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 COPCs (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>• Operation of sampling vessel and equipment from inside boat house</li> <li>• Subsurface sediment core collection</li> <li>• Surface sediment sample collection and processing</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 checked="" type="checkbox"/> High-visibility traffic safety vest						
	<input checked="" type="checkbox"/> Chemical-resistant clothing <u>check appropriate garments:</u> <table border="0" style="width: 100%; margin-left: 20px;"> <tr> <td><input checked="" type="checkbox"/> One-piece coverall</td> <td><input type="checkbox"/> Hooded one- or two-piece chemical splash suit</td> </tr> <tr> <td><input checked="" type="checkbox"/> Disposable chemical coveralls</td> <td><input type="checkbox"/> Chemical-resistant hood and apron</td> </tr> <tr> <td><input checked="" type="checkbox"/> Bib-style overalls and jacket with hood</td> <td></td> </tr> </table> <p><b>Fabric Type:</b> Tyvek            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"/> One-piece coverall	<input type="checkbox"/> Hooded one- or two-piece chemical splash suit	<input checked="" type="checkbox"/> Disposable chemical coveralls	<input type="checkbox"/> Chemical-resistant hood and apron	<input checked="" type="checkbox"/> Bib-style overalls and jacket with hood	
	<input checked="" type="checkbox"/> One-piece coverall	<input type="checkbox"/> Hooded one- or two-piece chemical splash suit					
	<input checked="" type="checkbox"/> Disposable chemical coveralls	<input type="checkbox"/> Chemical-resistant hood and apron					
	<input checked="" type="checkbox"/> Bib-style overalls and jacket with hood						
	<input checked="" type="checkbox"/> Disposable inner gloves (latex or equivalent "surgical")						
	<input checked="" type="checkbox"/> Disposable chemical-resistant outer gloves <b>Material Type:</b> Nitrile						
	<input checked="" 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 <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 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 decibels [dB] based on an 8-hour time-weighted average [TWA]). <b>Type:</b> Expanding foam							
<input type="checkbox"/> Two-way radio communication (intrinsically safe, if explosive atmosphere is a potential)							

Job Tasks	PPE Requirements
	<input type="checkbox"/> Long cotton underwear <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) <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"/> Half-face air-purifying respirator (APR) (OSHA/NIOSH-approved) <input type="checkbox"/> Full-face APR (OSHA/NIOSH-approved) <input type="checkbox"/> <b>Type of Cartridges to be Used:</b> <input type="checkbox"/> <b>OV</b> or <input type="checkbox"/> <b>OV/HEPA (if samples are dry)</b>
<ul style="list-style-type: none"> <li>Subsurface sediment core processing on land</li> </ul>	<input checked="" type="checkbox"/> Standard work uniform/coveralls <input checked="" type="checkbox"/> Work boots with safety toe conforming to ASTM F2412-05/ASTM F2413-05 <input type="checkbox"/> High-visibility traffic safety vest <input type="checkbox"/> Chemical-resistant clothing <u>check appropriate garments:</u> <input type="checkbox"/> One-piece coverall <input type="checkbox"/> Hooded one- or two-piece chemical splash suit <input type="checkbox"/> Disposable chemical coveralls <input type="checkbox"/> Chemical-resistant hood and apron <input type="checkbox"/> Bib-style overalls and jacket with hood <b>Fabric Type:</b> Tyvek 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. <input checked="" type="checkbox"/> Disposable inner gloves (latex or equivalent "surgical") <input type="checkbox"/> Disposable chemical-resistant outer gloves <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 <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

Job Tasks	PPE Requirements
	<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 dB based on an 8-hour TWA). <b>Type:</b> Expanding foam
	<input type="checkbox"/> Two-way radio communication (intrinsically safe, if explosive atmosphere is a potential)
	<input type="checkbox"/> Long cotton underwear
	<input 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 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> <input type="checkbox"/> OV or <input type="checkbox"/> OV/HEPA (if samples are dry)

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

Instrument*	Job Tasks/Functions	Measurement	Monitoring Schedule <sup>3</sup>	Actions <sup>1</sup>
FID and/or PID (11.7*eV Lamp; Measures Total 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 5 ppm above background in breathing zone	Periodically (every 15 to 30 minutes)	Acceptable, continue work.
		> 5 to 25 ppm above background	Periodically (every 15 minutes)	Upgrade to Level C <sup>4</sup> protection. Monitor for any low exposure limit COPCs 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.
		> 25 ppm above background in breathing zone		Stop work required. <sup>2</sup> Leave work area and contact PM and DOHS for guidance.

Notes:

\*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 Remedial Investigation Work Plan. 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 Remedial Investigation Work Plan 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 Remedial Investigation Work Plan 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 Attachment B-2 and include the following field tasks:

- Field activities
- Sediment sampling
- General boating activities
- Decontamination activities
- Motor vehicle operation
- Sample and laboratory glassware handling
- Investigation-derived waste management
- Unmanned aerial system operations

### **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 Attachment B-2, 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. Attachment B-2 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 COPCs 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 Attachment B-3).



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

Chemical	Exposure Routes	Symptoms	Target Organs	Occupational Exposure Limits	Odor Threshold (ppm)	LEL (%)	Ionization Potential (eV)
Dioxins/furans (as 2,3,7,8-TCDD) CAS No. 1746-01-6	Inhalation, skin absorption, ingestion, skin and/or eye contact	In humans: Irritation to eyes; allergic dermatitis, chloracne; porphyria; gastrointestinal disturbance; possible reproductive, teratogenic effects In animals: liver, kidney damage; hemorrhage; (potential occupational carcinogen)	Eyes, skin, liver, kidneys, reproductive system	None (as low as reasonably practical)	--	Unknown	Unknown
Diesel/heavy Oil	Inhalation, skin absorption, ingestion, skin and/ or eye contact	Irritation to eyes, nose, and throat	Eyes, skin, liver, kidneys, respiratory system, central nervous system	OSHA TWA 100 mg/m <sup>3</sup>	--	--	--
PAHs (as coal tar pitch volatiles) CAS No. 65996-93-2	Inhalation, skin and/or eye contact	Dermatitis, bronchitis (potential occupational carcinogen)	Respiratory system, skin, bladder, kidneys (lung, kidney, and skin cancer)	NIOSH REL TWA <sub>8</sub> 0.1 mg/m <sup>3</sup>	--	--	--
PCBs (CAS No. 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 TWA 0.001 mg/m <sup>3</sup> OSHA PEL TWA 1 mg/m <sup>3</sup>	--	--	Unknown
Aluminum (CAS No. 7429-90-5)	Inhalation, skin, and/or eye contact	Irritation to eyes, skin, and respiratory system	Eyes, skin, respiratory system	NIOSH REL TWA 10 mg/m <sup>3</sup>	--	--	--

Chemical	Exposure Routes	Symptoms	Target Organs	Occupational Exposure Limits	Odor Threshold (ppm)	LEL (%)	Ionization Potential (eV)
Antimony (CAS No. 7440-36-0)	Inhalation, ingestion, skin and/or eye contact	Irritation to 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 TWA 0.5 mg/m <sup>3</sup> OSHA PEL TWA 0.5 mg/m <sup>3</sup>	--	--	--
Arsenic (CAS No. 7440-38-2)	Inhalation, skin absorption, skin and/or eye contact, ingestion	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, respiratory irritation, hyperpigmentation of skin, potential occupational carcinogen	Liver, kidneys, skin, lungs, lymphatic system	NIOSH REL 0.002 mg/m <sup>3</sup> OSHA PEL TWA 0.010 mg/m <sup>3</sup>	--	--	--
Barium (CAS No. 10361-37-2)	Inhalation, ingestion, skin and/or eye contact	Irritation to eyes, skin, upper respiratory system; skin burns; gastroenteritis; muscle spasm; slow pulse; extrasystoles; hypokalemia	Eyes, skin, respiratory system, heart, central nervous system	NIOSH REL TWA 0.5 mg/m <sup>3</sup> OSHA PEL TWA 0.5 mg/m <sup>3</sup>	--	--	Unknown
Beryllium (CAS No. 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	STEL 0.002 mg/m <sup>3</sup> OSHA PEL TWA 0.0002 mg/m <sup>3</sup>	--	--	--
Cadmium (CAS No. 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	OSHA PEL TWA 0.005 mg/m <sup>3</sup>	--	--	--

Chemical	Exposure Routes	Symptoms	Target Organs	Occupational Exposure Limits	Odor Threshold (ppm)	LEL (%)	Ionization Potential (eV)
Calcium (CAS No. 1344-95-2)	Inhalation, skin and/or eye contact	Irritation eyes, skin, upper respiratory system	Eyes, skin, respiratory system	NIOSH REL TWA 10 mg/m <sup>3</sup> OSHA PEL TWA 15 mg/m <sup>3</sup>	--	--	--
Chromium (CAS No. 7440-47-3)	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin; lung fibrosis (histologic)	Eyes, skin, respiratory system	NIOSH REL TWA 0.5 mg/m <sup>3</sup> OSHA PEL TWA 1 mg/m <sup>3</sup>	--	--	--
Cobalt (CAS No. 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	NIOSH REL TWA 0.05 mg/m <sup>3</sup> OSHA PEL TWA 0.1 mg/m <sup>3</sup>	--	--	--
Copper (CAS No. 1317-38-0)	Inhalation, skin and/or eye contact	Irritation eyes, upper respiratory system; metal fume fever: chills, muscle ache, nausea, fever, dry throat, cough, lassitude (weakness, exhaustion); metallic or sweet taste; discoloration skin, hair	Eyes, skin, respiratory system (increased risk with Wilson's disease)	NIOSH REL TWA 0.1 mg/m <sup>3</sup> OSHA PEL TWA 0.1 mg/m <sup>3</sup>	--	--	--
Iron (CAS No. 7705-08-0)	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; abdominal pain, diarrhea, vomiting; possible liver damage	Eyes, skin, respiratory system, liver, gastrointestinal tract	NIOSH REL TWA 1 mg/m <sup>3</sup>	--	--	--
Lead (CAS No. 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	NIOSH REL TWA 0.050 mg/m <sup>3</sup> OSHA PEL TWA 0.050 mg/m <sup>3</sup>	--	--	--

Chemical	Exposure Routes	Symptoms	Target Organs	Occupational Exposure Limits	Odor Threshold (ppm)	LEL (%)	Ionization Potential (eV)
Magnesium (CAS No. 1309-48-4)	Inhalation, skin and/or eye contact	Irritation eyes, nose; metal fume fever: cough, chest pain, flu-like fever	Eyes, respiratory system	OSHA PEL TWA 15 mg/m <sup>3</sup>	--	--	--
Manganese (CAS No. 7439-96-5)	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	NIOSH REL TWA 1 mg/m <sup>3</sup> OSHA PEL 5 mg/m <sup>3</sup>	--	--	--
Nickel (CAS No. 7440-02-0)	Inhalation, ingestion, skin and/or eye contact	Sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]	Nasal cavities, lungs, skin	NIOSH REL TWA 0.015 mg/m <sup>3</sup> OSHA PEL TWA 1 mg/m <sup>3</sup>	--	--	--
Selenium (CAS No. 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	NIOSH REL TWA 0.2 mg/m <sup>3</sup> OSHA PEL TWA 0.2 mg/m <sup>3</sup>	--	--	--
Silver (CAS No. 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	NIOSH REL TWA 0.01 mg/m <sup>3</sup> OSHA PEL TWA 0.01 mg/m <sup>3</sup>	--	--	--
Sodium (CAS No. 1310-73-2)	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; pneumonitis; eye, skin burns; temporary loss of hair	Eyes, skin, respiratory system	NIOSH REL 2 mg/m <sup>3</sup> OSHA PEL TWA 2 mg/m <sup>3</sup>	--	--	--

Chemical	Exposure Routes	Symptoms	Target Organs	Occupational Exposure Limits	Odor Threshold (ppm)	LEL (%)	Ionization Potential (eV)
Thallium (CAS No. 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		NIOSH REL TWA 0.1 mg/m <sup>3</sup> OSHA PEL TWA 0.1 mg/m <sup>3</sup>	--	--	--
Vanadium (CAS No. 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	NIOSH REL 0.05 mg/m <sup>3</sup> OSHA PEL 0.5 mg/m <sup>3</sup>	--	--	--
Zinc (CAS No. 1314-13-2)	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 TWA 5 mg/m <sup>3</sup> OSHA PEL TWA 5 mg/m <sup>3</sup>	--	--	--
Mercury (CAS No. 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	NIOSH REL TWA 0.05 mg/m <sup>3</sup> OSHA PEL TWA 0.1 mg/m <sup>3</sup>	--	--	Unknown

## Notes:

Department of Human Health and Services, 2007. *NIOSH Pocket Guide to Chemical Hazards*.

American Conference of Governmental Industrial Hygienists, 2023. *Toluene*. Accessed November 13, 2023. Available at: <https://www.acgih.org/toluene/>.

## 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 Sediment Sampling Work Zones**

This subsection contains guidelines concerning health and safety aboard marine sampling vessels. The vessel captain, onshore coring operator, and the FL will delineate the boundaries of the work zones aboard the vessel and will inform the field team of the arrangement. The purpose of the zones is to limit the migration of sample material out of the zones and to restrict access to active work areas.

Two work zones will be observed aboard the vessel. One will encompass the “moonhole” of the vessel where the samplers will be deployed and recovered. Only the coring team may enter this zone unless assistance is required by other personnel. The second work zone will be a sample processing area on the vessel. The contractor team will deliver sediment core tubes to this zone and open them. Anchor QEA personnel will log and process the sediment cores either on the boat or on shore.

Both the collection and processing areas on the vessel and onshore will have a SZ outside the CRZ to stage clean equipment, don PPE, take rest breaks, or perform any other site activities that do not involve potentially contaminated materials.

#### **7.4.1.1 Vessel Decontamination Area**

A station will be set up for decontaminating sample processing equipment and personnel gear such as boots or PPE. The station will have the buckets, brushes, soapy water, rinse water, or wipes necessary to perform decontamination operations. Plastic bags will be provided for expendable and disposable materials. Decontamination fluids will be stored in sealable containers and will be properly disposed of.

#### **7.4.1.2 Access Control**

Security and control of access to the sampling vessel and onshore area will be the responsibility of the captain and FL. Additional security measures may be placed into effect by the client, or as required by national security threat levels determined by the federal government. Access to the vessel and onshore areas will only be granted to necessary project personnel and authorized visitors. Any security or access control problems will be reported to the client or appropriate authorities.

#### **7.4.1.3 Safety Equipment**

In addition to PPE that will be worn by shipboard personnel, basic emergency and first aid equipment will also be provided. Equipment will include:

- U.S. Coast Guard (USCG)-approved personal flotation devices (PFDs)
- 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

See Sections 12.1.11 and 12.1.12 for additional information regarding motor vehicle operation and vehicular traffic.

## 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

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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.

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**

<b>Type of Communication</b>	<b>Communication Device</b>	<b>Signal</b>
Emergency notification	On-site Telephone or Cellular Telephone	Initiate phone call using applicable emergency numbers
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 Attachment B-4 and will be kept on internal file.

### 9.1 Initial Project Site Orientation

All staff are required to complete Camas Mill Contractor Orientation training prior to commencing work. In addition, 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 Remedial Investigation Work Plan 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 Attachment B-1 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 Attachment B-3 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 project. 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 Remedial Investigation Work Plan 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 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 DOHS 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. Manufacturer's data have been evaluated for three types of respirators: Scott, MSA, and Survivair.



See Table 10-1 for an OV cartridge change-out schedule for total hydrocarbons and benzene.

**Table 10-1  
Respirator Cartridge Change-Out Schedule**

Total Hydrocarbons (Toluene, Ethylbenzene, Xylenes) Air Concentration (ppm)	Change-Out Schedule			
	SCOTT642 OV/Acid Gas642 OV642 MPC Cartridges	MSA Ultra Twin GME Cartridge	Survivair Organic Vapor Cartridge 100100	Survivair OV/Acid Gas Cartridge 100300/1053 (includes P-100)
< 150	8 hours	8 hours	8 hours	8 hours
> 150 to 200	8 hours	8 hours	8 hours	8 hours
> 200 to 250	8 hours	8 hours	8 hours	8 hours
> 250	Stop Work	Stop Work	Stop Work	Stop Work
Benzene Air Concentration (ppm)	SCOTT642 OV/Acid Gas642 OV642 MPC Cartridges	MSA Ultra Twin GME Cartridge	Survivair Organic Vapor Cartridge 100100	Survivair OV/Acid Gas Cartridge 100300/1053 (includes P-100)
< 10	8 hours	8 hours	8 hours	8 hours
> 10 to 100	8 hours	8 hours	8 hours	7 hours
> 100 to 125	7 hours	7 hours	7 hours	6 hours
> 125	Stop Work	Stop Work	Stop Work	Stop Work

Personnel using a respirator that is not listed above must contact the DOHS to determine the change-out schedule for the particular respirator used. Any questions regarding the site-specific respiratory protection program must be directed to the FL and PM.

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 over-exposure.

### 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

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 COPCs, 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.

Air monitoring results shall be documented on the Daily Air Monitoring Record form (see Attachment B-1) 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 COPCs. Time-integrated air monitoring would be required if there is the possibility that employees would be exposed to concentrations of a COPC 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 Attachment B-1) 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, or the American Conference of Governmental Industrial Hygienists TLVs. The rationale for establishing action levels is based on the available data that characterize COPCs 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 COPCs).



## 12 Health and Safety Procedures and Practices

In addition to the task-specific JSAs listed in Section 6.1 and presented in Attachment B-2, 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 COPCs and/or contaminated materials or equipment.
- No tobacco products or cosmetics shall be present or used in areas that have the potential to contain COPCs 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 Sediment Core Sampling*

Sediment samples will be collected using a “Mud Mole” or vibracore sampling equipment operated from a boat. Please see Sections 12.1.14 and 12.1.15 for additional safety information regarding working on or near the water.

All operations involving the use of powered sediment coring rigs will follow generally accepted drilling/coring practices. One person will be assigned the responsibility of Lead Driller/Corer. Additional personnel will assist with equipment as needed. The Lead Driller/Corer will be responsible for operating the drilling/coring rig and ensuring safety.

General rules associated with drilling/coring rig operations will be as follows:

- While drilling, all non-essential personnel shall remain at a distance that is past the radius of any moving parts.
- All operators and team members will be familiar with the rig operations and will have received practical training.
- All personnel will be instructed in the use of the emergency kill switch/shutdown on the drill rig.
- No loose-fitting clothing, jewelry, or free long hair is permitted near the drilling rig or moving machinery parts.
- A first aid kit and fire extinguisher will be available at all times.
- No drilling will occur during impending electrical storms or tornadoes, or when rain, ice, snow, or wind conditions create undue potential hazards.
- Never allow "horsing around" within the vicinity of the drill rig and tool and supply storage areas, even when the drill rig is shut down.

### *12.1.5 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 are 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 Attachment B-1). No excavation work is to be performed until all utility mark-outs are 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 a distance of 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

Notes:

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 the power off 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 on this table, add 0.4 inches per kilovolt (kV) to obtain the safe distance between equipment and power lines.

### 12.1.6 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 lockout/tagout (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.

### *12.1.7 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 Z3591 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.

### *12.1.8 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 Near Railways*

When working near railways or in rail yards, observe the following procedures and practices:

- Plan work activities well ahead of time, including coordination with the railway owner(s) and operator(s).
- Always assume work near railways requires a permit from the railway owner/operator.
- Maintain emergency rail yard and railway owner/operator contact information at the field location.
- Become cognizant of train signals such as horns and lights, in order to understand potential train activity.
- Follow all railway owner/operator required procedures.
- Plan work activities to minimize time spent adjacent to tracks.
- Expect movement from on-track equipment at any time.
- Before approaching a track, look in both directions. Make sure it's safe to get on or cross the track.
- Never cross a track in front of oncoming traffic.
- When on-track equipment is approaching, stay at least 30 feet from the track while the equipment is passing.
- Watch for protruding structures on passing equipment as well as other hazards.
- Do not stage or store equipment unattended within 30 feet of tracks.
- When rail traffic is approaching, move away from the track, and warn your coworkers of approaching rail traffic.
- Never sit, walk, step, stand, or lie down on rails, including other track components such as switch points, frogs, guard rails, derails, and wheel stops.
- Do not lean on, climb on, or go under any on-track equipment unless your job requires it, in which case do so only after all required safety procedures have been put in place.

- Do not walk between on-track equipment unless they are separated by at least 50 feet.
- Keep at least 30 feet from the end of standing trains, cars, or locomotives. This will allow you time to react safely to any movement of the equipment.
- Avoid being trapped between on-track equipment passing on adjacent tracks.

### 12.1.13 Boating Operations

The following precautions shall be followed when conducting boating trailer and launch activities:

- Follow the trailer and boat manufacturers' instructions for securing the boat to the trailer.
- Follow the trailer manufacturer's instructions for securing the trailer to the towing vehicle.
- Prohibit site personnel from moving into trailer/vehicle pinch points without advising the vehicle operator.
- Use experienced operators when backing trailers on boat ramps.
- Wear proper work gloves when the possibility of pinching or other injury may be caused by moving or handling large or heavy objects.
- Maintain all equipment in a safe condition.
- Launch boats one at a time to avoid collisions.
- Use a spotter for vehicles backing boats to the launch area.
- Understand and review hand signals.
- Wear boots with non-slip soles when launching boats.
- Wear USCG-approved PFDs when working within 10 feet of the water.
- Keep ropes and lines coiled and stowed to eliminate trip hazards.
- Maintain three-point contact on dock/pier or boat ladders.
- Verify that drain plugs are in place.

The following precautions shall be followed when conducting boating operations:

- Maintain a current boater's license(s) as required.
- Wear USCG-approved PFDs for work activities within 10 feet of the water.
- Obtain and review information regarding dams that may be present in work areas, particularly with regard to "no boating" zones and safety buoys, cables, and warning signage.
- Maintain boat anchorage devices commensurate with anticipated currents, distance to shore, and water depths.
- Provide a floating ring buoy in the immediate boat launch/landing areas with at least 60 feet (18.3 meters) of line for a vessel less than 65 feet (19.8 meters) in length, or 90 feet (27.4 meters) of line for a vessel 65 feet (19.8 meters) or greater in length (see <https://www.law.cornell.edu/cfr/text/46/117.70> for more information).
- Step into the center of the boat.
- Keep your weight low when moving on the boat.
- Move slowly and deliberately.

- Steer directly across other boat wakes at a 90-degree angle to avoid capsizing.
- Steer the boat facing forward.
- Watch for floating objects in the water.
- Right-of-way is yielded to vessels on your boat’s right, or starboard, and vessels with limited ability to maneuver such as any wind-propelled vessel.

The following precautions shall be followed when working on a boat:

- Observe proper lifting techniques.
- Obey lifting limits (see Section 12.1.17)
- Use mechanical lifting equipment (i.e., pulleys or winches) to move large or awkward loads.
- Wear USCG-approved PFDs for work activities within 10 feet of the water.

The safety-related items listed in Table 12-2 shall be available when conducting boating operations.

**Table 12-2  
Safety Equipment Specific to In-Water Work**

<b>Additional Safety Equipment for Sampling Vessel per U.S. Coast Guard Requirements:</b>
<ul style="list-style-type: none"> <li>• Proper vessel registration, numbering, and documentation (registered with state, certificate of vessel registration number displayed, and carrying a valid certificate of number)</li> <li>• USCG-approved personal flotation devices (PFDs; or life jackets) for every person on the sampling vessel (Type I, II, III, or V are required). High-visibility required by Anchor QEA.</li> <li>• Appropriate, non-expired, visual distress devices for day and night use from the following:               <ul style="list-style-type: none"> <li>– Three hand-held red flares (day and night), or</li> <li>– One hand-held red flare and two parachute flares (day and night), or</li> <li>– One hand-held orange smoke signal, two floating orange smoke signals (day), and one electric distress light (night only)</li> </ul> </li> <li>• Alternate means of propulsion (oars or paddles)</li> <li>• Dewatering device (pump or bailer)</li> <li>• Properly maintained and inspected USCG-approved fire extinguishers (no fixed system = (2) B-1 or (1) B-2 type extinguishers; fixed system = (1) B-1 type extinguisher)</li> <li>• Proper ventilation of gasoline-powered vessels</li> <li>• Sound-producing device (whistle, bell, or horn)</li> <li>• VHF 2-way radio</li> <li>• Proper navigational light display</li> <li>• Throwable life ring with attached line (any vessel larger than 16 feet is required to carry one Type IV [throwable] PFD)</li> </ul>

<b>Additional Safety Equipment for Sampling Vessel per U.S. Coast Guard Requirements:</b>	
<b>Additional USCG Recommended Equipment Includes:</b>	
<ul style="list-style-type: none"> <li>• Extra visual distress signals</li> <li>• Primary and spare anchor</li> <li>• Heaving line</li> <li>• Fenders</li> <li>• First aid kit</li> <li>• Flashlight</li> <li>• Mirror</li> <li>• Searchlight</li> <li>• Sunburn lotion</li> <li>• Tool kit</li> <li>• Spare fuel</li> </ul>	<ul style="list-style-type: none"> <li>• Boat hook</li> <li>• Spare propeller</li> <li>• Mooring line</li> <li>• Food and water</li> <li>• Binoculars</li> <li>• Spare batteries</li> <li>• Sunglasses</li> <li>• Marine hardware</li> <li>• Extra clothing</li> <li>• Spare parts</li> <li>• Pertinent navigational chart(s) and compass</li> </ul>

### 12.1.14 Working Over or Near Water

#### 12.1.14.1 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.

#### **12.1.14.2 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.

#### **12.1.15 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 Sound Level Meter 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 the DOHS.

### 12.1.16 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.

### *12.1.17 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.



### *12.1.18 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.

### *12.1.19 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 Attachment B-1) 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 TLVs**

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).			

Note:  
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**

<b>Hazardous Spider Identification Guide</b>	
<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 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.

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

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.

### *12.2.11 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.

### *12.2.12 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**

<b>Differences in Physical Appearance Between Canids</b>	
<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)



### 12.2.13 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.

### 12.2.14 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		
<p><b>Poison Ivy</b></p> <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>		
<p><b>Poison Oak</b></p> <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>		
<p><b>Poison Sumac</b></p> <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.

### *12.2.15 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.

### 12.2.16 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.



Attachment B-1

Health and Safety Logs and Forms

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# Daily Boat Checklist

Boat ID: \_\_\_\_\_  
 Project/Location: \_\_\_\_\_  
 Date: \_\_\_\_\_

Boat Operator: \_\_\_\_\_  
 Crew: \_\_\_\_\_  
 Visitors: \_\_\_\_\_

Item	Yes	No	N/A	Comments
Vessel registration numbers displayed				
Vessel registration documentation on board				
PFDs: one available per person				
PFDs: condition/inspection				
First aid kit				
Eye wash solution				
Fire extinguisher				
Visual distress signal				
Sound-producing device				
Navigation lights				
Paddle				
Rescue ring				
Project Health and Safety Plan				
Cellular phone				
Spill kit				
PPE (hard hats, safety glasses, steel toe boots, etc.)				
Cold weather suit ( <i>Float coat required at water temp of 40°F to 50°F. Float coat and bibs or one-piece suit required at water temp &lt; 40°F.</i> )				
GFI				
Radio check				
Clear deck, work area				
Drinking water				
Sunscreen				
Fuel level				
Drain plug				
Float plan				
Anchor/spuds				
Review boating JSAs				
Bilge pump operational				
Boat hull in sound condition				

**Notes:**

N/A: not applicable



# Field Safety Equipment Checklist

The following is a list of safety-related gear that may be appropriate depending on the type of work being conducted. The purpose of this checklist is twofold: 1) ensure that all field crew members think about appropriate safety gear needs before heading to the worksite; and 2) provide an extensive list of gear to consider in order to serve as a reminder of potential safety gear needs during a field effort.

## Safety Briefing Log or Notebook

### Personal Protective Gear

- Rain pants and jacket
- Hard hats
- Boots (steel-toed, if appropriate)
- Safety glasses
- Ear protection
- Nitrile gloves (inner and outer pair)
- Tyvek overalls
- H<sub>2</sub>S sensor
- Flashlight
- EpiPen (inquire if any field staff use one)
- Other:

### Communications

- Notify office staff of day's field plan
- Walkie Talkies
- Cell phones
- Satellite phone (if appropriate)
- Contact numbers (e.g., for other field crew members, the PM, or others to notify that you are accessing site)

### Boat Safety Gear

#### *U.S. Coast Guard Required Gear:*

- 1. Personal flotation device (PFD), preferably life jacket, for each occupant
- 2. Fire extinguisher (filled to operable range)
- 3. Flares (unexpired)
- 4. Horn
- 5. Navigation lights
- First aid kit
- Bowline and stern line
- Anchor and anchor line
- Paddle

### Warm Weather Safety Gear

- Sunscreen
- Water
- Hat
- Light clothes

### Cold Weather Safety Gear

- Warm clothes (preferably synthetics)
- Hat
- Gloves
- Boot warmers
- Thermos of warm drink/soup

### General Gear for Work Near Water

- Life jacket
- Boots or waders (hip or chest)
- Throwline
- Spare propeller and linchpin
- Appropriate personal protective gear (boots or waders) to step onto shore if necessary
- Drain plug (and spare)
- Boat fuel and oil
- Weather radio (if appropriate)
- Weather, tides, and currents forecasts
- Warm clothes/blanket in dry bag

# Modification to Health and Safety Plan

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

Project No: \_\_\_\_\_

Project Name: \_\_\_\_\_

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

# Heat Stress Monitoring Record



**Date:** \_\_\_\_\_  
**Project No:** \_\_\_\_\_  
**Project Name:** \_\_\_\_\_  
**Location:** \_\_\_\_\_

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.:
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**Notes:**

*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.*

**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**

**Project Name/No:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Field Lead:** \_\_\_\_\_ **Project Address:** \_\_\_\_\_

**Project Manager:** \_\_\_\_\_ **Health & Safety Officer:** \_\_\_\_\_

**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		
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		

# Utility Contact Prevention Checklist

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

Consideration	Check		Explanation	Initial
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

*Contractor:*

\_\_\_\_\_  
 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

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**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



Attachment B-2

Job Safety Analysis (JSA) Documents

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# Job Safety Analysis



## Field Activities – General

<b>Project Name:</b> Camas Mill Sediment Remedial Investigation Work Plan	<b>Project Number:</b> 230030-01.01	<b>JSA Number:</b> 001	<b>Issue Date:</b> 10/20/23
<b>Location:</b> 401 Northeast Adams Street Camas, Washington 98607	<b>Contractor:</b> Anchor QEA, LLC	<b>Analysis by:</b> Sigrid Tomlinson	<b>Analysis Date:</b> 10/20/23
<b>Work Operation:</b> Field activities	<b>Superintendent/Competent Person:</b> Sasha Norwood	<b>Revised by:</b> Sigrid Tomlinson	<b>Revised Date:</b> 10/20/23
<b>Required Personal Protective Equipment (PPE):</b>		<b>Reviewed by:</b> TBD	<b>Reviewed Date:</b> TBD
<ul style="list-style-type: none"> <li>Modified Level D—Long pants, long sleeves, and/or Tyvek coveralls if handling potentially contaminated media, and steel-toed footwear conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05. Work on any water vessel or within 10 feet of water will require U.S. Coast Guard-approved personal floatation devices (PFDs; see cold stress section for cold-weather PFD information).</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</li> </ul>		<b>Approved by:</b> TBD	<b>Approved Date:</b> TBD

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
If boating		<ul style="list-style-type: none"> <li>Follow the Job Safety Analysis (JSA) for boating activities (JSA 003).</li> </ul>	
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 – General

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 – General

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, and mosquitoes])	<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>Be aware of potential wildlife and defensive behavior (e.g., nesting birds, or animals with young).</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>

### 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 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



## Sediment Sampling

<b>Project Name:</b> Camas Mill Sediment Remedial Investigation Work Plan	<b>Project Number:</b> 230030-01.01	<b>JSA Number:</b> 002	<b>Issue Date:</b> 10/20/23
<b>Location:</b> 401 Northeast Adams Street Camas, Washington 98607	<b>Contractor:</b> Anchor QEA, LLC	<b>Analysis by:</b> Sigrid Tomlinson	<b>Analysis Date:</b> 10/20/23
<b>Work Operation:</b> Sediment sampling	<b>Superintendent/Competent Person:</b> Sasha Norwood	<b>Revised by:</b> Sigrid Tomlinson	<b>Revised Date:</b> 10/20/23
<b>Required Personal Protective Equipment (PPE):</b> <ul style="list-style-type: none"> <li>Modified Level D—Long pants, long sleeves, and/or Tyvek coveralls if handling potentially contaminated media, and steel-toed footwear conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05. Work on any water vessel or within 10 feet of water will require U.S. Coast Guard-approved personal flotation devices (PFD; see cold stress section for cold-weather PFD information).</li> <li>Safety glasses/splash goggles, hard hat, nitrile outer gloves and latex inner gloves</li> </ul>		<b>Reviewed by:</b> TBD	<b>Reviewed Date:</b> TBD
		<b>Approved by:</b> TBD	<b>Approved Date:</b> TBD

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
If boating		<ul style="list-style-type: none"> <li>Follow the Job Safety Analysis (JSA) for boating activities (JSA 003).</li> </ul>	
If using glassware		<ul style="list-style-type: none"> <li>Follow JSA 006 for handling glassware.</li> </ul>	
Sediment sample retrieval and processing	Injury from hand and power tool operation (e.g., spatula or drill)	<ul style="list-style-type: none"> <li>Be aware of sharp edges on hand tools (e.g., spatulas, knives, drill bits, and saw blades).</li> <li>Be aware of electrical connections and water hazards when working with electric- or battery-operated tools.</li> <li>Ensure that all tools are working properly; repair or replace defective tools. Repair when unplugged and off.</li> <li>Keep guards on power tools when not in use.</li> </ul>	<ul style="list-style-type: none"> <li>Inspect tools to ensure that they are in good working order.</li> <li>Inspect electrical connections (if applicable).</li> <li>Inspect tools periodically to ensure dry and clean operation.</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



## Sediment Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Sediment sample retrieval and processing (continued)	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/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>
	Ingestion of contaminants, or skin or eye contact with contaminants	<ul style="list-style-type: none"> <li>• Wear appropriate PPE to prevent/reduce exposure.</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> </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>
	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> <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>
	Pinch points	<ul style="list-style-type: none"> <li>• If boating, secure any unsecured objects on deck; they may shift on deck 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>• Avoid placing hands or self between boat and dock/piles.</li> </ul>	

# Job Safety Analysis



## Sediment Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Sediment sample retrieval and processing (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 extra 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> <li>• Inspect PFDs for integrity, particularly the cartridge charge on inflatable PFDs.</li> </ul>

# Job Safety Analysis



## Sediment Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
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>
	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 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



## Sediment Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
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>
	Biological hazards (flora [e.g., poison ivy and poison oak] and fauna [e.g., ticks, bees, spiders, and mosquitoes])	<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>

### 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 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



## General Boating Activities

<b>Project Name:</b> Camas Mill Sediment Remedial Investigation Work Plan	<b>Project Number:</b> 230030-01.01	<b>JSA Number:</b> 003	<b>Issue Date:</b> 10/20/23
<b>Location:</b> 401 Northeast Adams Street Camas, Washington 98607	<b>Contractor:</b> Anchor QEA, LLC	<b>Analysis by:</b> Sigrid Tomlinson	<b>Analysis Date:</b> 10/20/23
<b>Work Operation:</b> General boating activities	<b>Superintendent/Competent Person:</b> Sasha Norwood	<b>Revised by:</b> Sigrid Tomlinson	<b>Revised Date:</b> 10/20/23
<b>Required Personal Protective Equipment (PPE):</b> <ul style="list-style-type: none"> <li>U.S. Coast Guard (USCG)-approved personal flotation devices (PFDs; see cold stress section for cold-weather PFD information)</li> </ul>		<b>Reviewed by:</b> TBD	<b>Reviewed Date:</b> TBD
		<b>Approved by:</b> TBD	<b>Approved Date:</b> TBD

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Walking on deck	Pinch points	<ul style="list-style-type: none"> <li>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, such as on sampling gear.</li> <li>Avoid placing your hands or yourself between the boat and the dock or piles.</li> </ul>	

# Job Safety Analysis



## General Boating Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Walking on deck (continued)	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> <li>• Keep rope lines neatly coiled and stowed. Avoid stepping on or over lines.</li> </ul>	<ul style="list-style-type: none"> <li>• Routinely inspect work area for unsafe conditions.</li> </ul>
	Exceeding boat capacity	<ul style="list-style-type: none"> <li>• Keep the number of passengers and equipment as posted on boat placards within limits at all times. If conditions warrant, reduce capacity to maintain boat stability.</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure that field team is aware of limits and adheres accordingly.</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>• If the combined air and water temperature is below 90 degrees Fahrenheit (°F), wear a USCG-approved float coat, Mustang-type bib coveralls, or one-piece survival suit.</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



## General Boating Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Working outdoors (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 onboard.</li> </ul>
	Fog	<ul style="list-style-type: none"> <li>Wait for fog to lift for adequate visibility.</li> </ul>	<ul style="list-style-type: none"> <li>Review weather forecast prior to field work.</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.</li> <li>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 river flows or high waves	<ul style="list-style-type: none"> <li>Be aware of waves and forecasts and recent rainfall in your watershed.</li> </ul>	<ul style="list-style-type: none"> <li>Have forecast available.</li> </ul>
	High winds	<ul style="list-style-type: none"> <li>Wear goggles or safety glasses if dust or debris are visible.</li> <li>Stow or secure loads or equipment that could be moved by wind, particularly when underway.</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 onboard.</li> </ul>
	Biological hazards (e.g., mosquitoes, deer flies, and horse flies)	<ul style="list-style-type: none"> <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> </ul>	<ul style="list-style-type: none"> <li>Ensure that insect repellent is onboard.</li> </ul>

# Job Safety Analysis



## General Boating Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Vessel emergencies	Person overboard	<p>If you witness someone fall overboard:</p> <ul style="list-style-type: none"> <li>• Yell, "Person overboard!"</li> <li>• Throw a flotation device immediately.</li> <li>• If the engine is running, take it out of gear and swing the stern clear to keep from hitting the person.</li> <li>• Call 911 or USCG as appropriate.</li> <li>• Assign a spotter to keep the person in sight at all times.</li> <li>• Contact nearby vessels for assistance.</li> <li>• Recover the person from the water.</li> </ul> <p>If you fall overboard:</p> <ul style="list-style-type: none"> <li>• Hold your mouth and nose closed and protect your head.</li> <li>• When you reach the surface, look for movement, listen for sounds, and call for help. Use the whistle attached to the PFD and activate the beacon light.</li> <li>• It is only sensible to swim if there is reason to believe you have a chance of reaching your destination. Too much movement in cold water causes hypothermia.</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure that flotation devices are available.</li> <li>• Ensure that team wears PFDs.</li> <li>• Inspect PFDs for integrity, particularly the cartridge charge on inflatable PFDs.</li> </ul>
	Fire, abandon ship	<ul style="list-style-type: none"> <li>• Be prepared to abandon ship in case of major fire (too large to control with a fire extinguisher), or other emergency.</li> <li>• Only the boat captain can order abandon ship.</li> <li>• Communicate intent to abandon ship to all personnel onboard.</li> <li>• Notify USCG and nearby vessels of intent to abandon ship.</li> <li>• Call 911.</li> <li>• Notify the Project Manager and Field Lead, if time permits.</li> <li>• Be aware of the propeller position before abandoning ship.</li> <li>• Identify a rally point for all personnel.</li> <li>• Know the dangers of hypothermia.</li> <li>• Use the buddy system to support injured personnel.</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure that fire extinguisher is available, current, and in working order.</li> <li>• Review abandon ship procedures with field team prior to work.</li> </ul>
Navigation	Boat traffic	<ul style="list-style-type: none"> <li>• Maintain a safe operating distance from shoreline and other vessels.</li> </ul>	<ul style="list-style-type: none"> <li>• Be aware of on-water surroundings.</li> </ul>

# Job Safety Analysis



## General Boating Activities

### 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 professional captained vessel is not in use, boat operators must take 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



## Decontamination Activities

<b>Project Name:</b> Camas Mill Sediment Remedial Investigation Work Plan	<b>Project Number:</b> 230030-01.01	<b>JSA Number:</b> 004	<b>Issue Date:</b> 10/20/23
<b>Location:</b> 401 Northeast Adams Street Camas, Washington 98607	<b>Contractor:</b> Anchor QEA, LLC	<b>Analysis by:</b> Sigrid Tomlinson	<b>Analysis Date:</b> 10/20/23
<b>Work Operation:</b> Decontamination activities	<b>Superintendent/Competent Person:</b> Sasha Norwood	<b>Revised by:</b> Sigrid Tomlinson	<b>Revised Date:</b> 10/20/23
<b>Required Personal Protective Equipment (PPE):</b> <ul style="list-style-type: none"> <li>Standard work uniform, latex inner gloves, and work boots with safety toe</li> <li>Hard hat where overhead hazards and/or heavy equipment are present</li> <li>U.S. Coast Guard-approved personal flotation device (PFD), if boating (see cold stress section for cold-weather PFD information)</li> </ul>	<b>Reviewed by:</b> TBD	<b>Reviewed Date:</b> TBD	
	<b>Approved by:</b> TBD	<b>Approved Date:</b> TBD	

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
If boating		<ul style="list-style-type: none"> <li>Follow the Job Safety Analysis (JSA) for boating activities (JSA 003).</li> </ul>	
Decontamination area set up	Vehicle, heavy equipment traffic, or boat traffic in work area	<ul style="list-style-type: none"> <li>Wear high-visibility safety vest and hard hat PPE.</li> <li>Be alert when working around heavy equipment and/or other boats, especially if wearing hearing protection.</li> </ul>	<ul style="list-style-type: none"> <li>Ensure that safety vests are available for staff and visitors.</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.</li> <li>If boating, avoid carrying objects directly onto or off of 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>
	Biological hazards (flora [e.g., poison ivy, and poison oak] and fauna [e.g., ticks, bees, spiders, mosquitoes])	<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>

# Job Safety Analysis



## Decontamination Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Decontamination activities	Injury from hand and power tool operation (e.g., spatula or drill)	<ul style="list-style-type: none"> <li>• Be aware of sharp edges on hand tools (e.g., spatulas, knives, drill bits, and saw blades).</li> <li>• Be aware of electrical connections and water hazards when working with electric- or battery-operated tools.</li> <li>• Ensure that all tools are working properly; repair or replace defective tools. Repair when unplugged and off.</li> <li>• Keep guards on power tools when not in use.</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect tools to ensure that they are in good working order.</li> <li>• Inspect electrical connections (if applicable).</li> <li>• Inspect tools periodically to ensure dry and clean operation.</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>
	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>• 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>
	Ingestion of contaminants or decontamination fluids, or skin or eye contact with contaminants or decontamination fluids	<ul style="list-style-type: none"> <li>• Wear appropriate PPE to prevent/reduce exposure.</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> </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>



# Job Safety Analysis



## Decontamination Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
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>
	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> </ul>	<ul style="list-style-type: none"> <li>Obtain weather forecast and updates as needed.</li> </ul>

# Job Safety Analysis



## Decontamination Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
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.
- 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 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



## Anchor QEA Motor Vehicle Operation

<b>Project Name:</b> Camas Mill Sediment Remedial Investigation Work Plan	<b>Project Number:</b> 230030-01.01	<b>JSA Number:</b> 005	<b>Issue Date:</b> 10/20/23
<b>Location:</b> 401 Northeast Adams Street Camas, Washington 98607	<b>Contractor:</b> Anchor QEA, LLC	<b>Analysis by:</b> Sigrid Tomlinson	<b>Analysis Date:</b> 10/20/23
<b>Work Operation:</b> Anchor QEA motor vehicle operation	<b>Superintendent/Competent Person:</b> Vehicle Driver	<b>Revised by:</b> Sigrid Tomlinson	<b>Revised Date:</b> 10/20/23
<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> TBD	<b>Reviewed Date:</b> TBD
		<b>Approved by:</b> TBD	<b>Approved Date:</b> TBD

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
Anchor QEA motor vehicle operation (continued)	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 the Anti-Lock Braking System (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>
	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
Anchor QEA motor vehicle operation (continued)	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>
	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>

# Job Safety Analysis



## Anchor QEA Motor Vehicle Operation

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Anchor QEA motor vehicle operation (continued)	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>
	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>
	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 required annual driver training.

# 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



# Job Safety Analysis



## Anchor QEA Motor Vehicle Operation

Date	Name (print)	Signature

# Job Safety Analysis



## Sample and Laboratory Glassware Handling

<b>Project Name:</b> Camas Mill Sediment Remedial Investigation Work Plan	<b>Project Number:</b> 230030-01.01	<b>JSA Number:</b> 006	<b>Issue Date:</b> 10/20/23
<b>Location:</b> 401 Northeast Adams Street Camas, Washington 98607	<b>Contractor:</b> Anchor QEA, LLC	<b>Analysis by:</b> Sigrid Tomlinson	<b>Analysis Date:</b> 10/20/23
<b>Work Operation:</b> Sample and laboratory glassware handling	<b>Superintendent/Competent Person:</b> Sasha Norwood	<b>Revised by:</b> Sigrid Tomlinson	<b>Revised Date:</b> 10/20/23
<b>Required Personal Protective Equipment (PPE):</b>		<b>Reviewed by:</b>	<b>Reviewed Date:</b>
<ul style="list-style-type: none"> <li>Modified Level D—Long pants, long sleeves, latex inner gloves, 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: Tyvek coveralls, safety glasses/splash goggles, hard hat, hearing protection, nitrile outer gloves and latex inner gloves Work on any water vessel or within 10 feet of water will require U.S. Coast Guard-approved personal flotation devices (PFDs).</li> </ul>		TBD	TBD
		<b>Approved by:</b>	<b>Approved Date:</b>
		TBD	TBD

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> </ul>	<ul style="list-style-type: none"> <li>Ensure dividers are sufficient and will remain in place during transport.</li> </ul>
	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>	

# Job Safety Analysis



## Sample and Laboratory Glassware Handling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Filling sample containers (continued)	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>	
	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>
Unpacking glassware returned from a laboratory	Breakage during packing and shipment	<ul style="list-style-type: none"> <li>Carefully inspect cooler contents prior to reaching in with hands.</li> <li>If glassware is broken, utilize cut-resistant gloves or no-touch tool to remove from cooler.</li> </ul>	<ul style="list-style-type: none"> <li>Ensure glassware did not break during packing or shipment.</li> </ul>
	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 in the event that glassware preservatives have leaked into the cooler.</li> </ul>	<ul style="list-style-type: none"> <li>Look for unexpected moisture in cooler.</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



## Investigation-Derived Waste Management

<b>Project Name:</b> Camas Mill Sediment Remedial Investigation Work Plan	<b>Project Number:</b> 230030-01.01	<b>JSA Number:</b> 007	<b>Issue Date:</b> 10/20/23
<b>Location:</b> 401 Northeast Adams Street Camas, Washington 98607	<b>Contractor:</b> Anchor QEA, LLC	<b>Analysis by:</b> Sigrid Tomlinson	<b>Analysis Date:</b> 10/20/23
<b>Work Operation:</b> Investigation-derived waste management	<b>Superintendent/Competent Person:</b> Sasha Norwood	<b>Revised by:</b> Sigrid Tomlinson	<b>Revised Date:</b> 10/20/23
<b>Required Personal Protective Equipment (PPE):</b> <ul style="list-style-type: none"> <li>Modified Level D—Long pants, long sleeves, and/or Tyvek coveralls if handling potentially contaminated media, and steel-toed footwear conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05. Work on any water vessel or within 10 feet of water will require U.S. Coast Guard-approved personal flotation devices (PFDs).</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</li> </ul>	<b>Reviewed by:</b> TBD	<b>Reviewed Date:</b> TBD	
	<b>Approved by:</b> TBD	<b>Approved Date:</b> TBD	

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 pallet for easy transfer using a pallet jack, if possible.</li> <li>• If transporting containers on a pallet, strap or band the containers together to prevent them from falling off.</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 (JSA)



## Unmanned Aerial System Operations

<b>Project Name:</b> Camas Mill Sediment Remedial Investigation Work Plan	<b>Project Number:</b> 230030-01.01	<b>JSA Number:</b> 008	<b>Issue Date:</b> 10/20/23
<b>Location:</b> 401 Northeast Adams Street Camas, Washington 98607	<b>Contractor:</b> Anchor QEA, LLC	<b>Analysis by:</b> Sigrid Tomlinson	<b>Analysis Date:</b> 10/20/23
<b>Work Operation:</b> Unmanned aerial system operations	<b>Superintendent/Competent Person:</b> TBD	<b>Revised by:</b> Sigrid Tomlinson	<b>Revised Date:</b> 10/20/23
<b>Required Personal Protective Equipment (PPE):</b> <ul style="list-style-type: none"> <li>Steel-toed boots</li> <li>Safety vest</li> <li>Safety glasses</li> <li>Gloves</li> </ul>	<b>Safety Controls:</b> <ul style="list-style-type: none"> <li>Eliminate</li> <li>Substitute</li> <li>Engineer</li> <li>Administrative</li> <li>PPE</li> </ul>	<b>Reviewed by:</b> TBD	<b>Reviewed Date:</b> TBD
		<b>Approved by:</b> TBD	<b>Approved Date:</b> TBD

<b>Overall Risk Assessment Code (RAC) (use highest code)</b>					<b>L</b>
<b>Risk Assessment Code (RAC) Matrix</b>					
Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L
<b>Step 1:</b>	<p>Review each "Hazard" with identified "Safety Controls" and determine the RAC (see above).  <b>The RAC is developed after correctly identifying all the hazards and fully implementing all controls.</b></p> <p><b>"Probability"</b> is the likelihood to cause an incident, near miss, or accident and is identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.</p> <p><b>"Severity"</b> is the outcome/degree if an incident, near miss, or accident did occur and is identified as: Catastrophic, Critical, Marginal, or Negligible.</p>				<b>RAC Chart</b>
					<b>E = Extremely High Risk</b>
					<b>H = High Risk</b>
					<b>M = Moderate Risk</b>

# Job Safety Analysis (JSA)



## Unmanned Aerial System Operations

**Step 2:** Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" in the JSA. Annotate the overall highest RAC at the top of the JSA. **L = Low Risk**

Work Activity	Potential Hazards	Preventive Measures or Controls	Probability	Severity	RAC
Pre-Flight Planning	Operations in controlled or restricted airspace, weather	<ul style="list-style-type: none"> <li>Consult sectional charts to determine airspace classification (examples: skyvector.com, vfrmap.com, Kittyhawk.io application); operate only in uncontrolled (Class G) airspace unless a certificate of waiver/authorization has been obtained.</li> <li>Consult Notices to Airmen (NOTAMs; <a href="https://pilotweb.nas.faa.gov/PilotWeb/">https://pilotweb.nas.faa.gov/PilotWeb/</a>) for information concerning the establishment, condition, or change in any component (facility, service, or procedure of, or hazard in the National Airspace System), the timely knowledge of which is essential to personnel concerned with flight operation.</li> <li>Consult Temporary Flight Restrictions (TFRs; <a href="http://tfr.faa.gov/tfr2/list.html">http://tfr.faa.gov/tfr2/list.html</a>) for information pertaining to any temporary airspace restrictions.</li> <li>Consult weather forecasts for rain, wind, and visibility.</li> <li>Investigate whether state or local laws may affect operations.</li> <li>Obtain permission from property owner and notify adjacent property owners of the planned operations as needed.</li> </ul>	S	M	L
Aerial Survey	Loss of power	<ul style="list-style-type: none"> <li>Charge all batteries for unmanned aircraft.</li> <li>Charge controller battery.</li> <li>Charge phone battery, if phone will be used during the operation.</li> <li>Charge two-way radios, if used during the operation.</li> <li>Maintain spare batteries for unmanned aircraft and ability to recharge controller and phone batteries if multiple flights will be completed.</li> </ul>	S	M	L
	Equipment Malfunction	<ul style="list-style-type: none"> <li>Inspect propellers for tightness and cracks or missing pieces.</li> <li>Inspect drone for structural defects.</li> <li>Check for adequate number of satellites utilized for operation.</li> <li>Check for connection with radio transmitter and drone.</li> <li>Check that camera connection is operating properly.</li> </ul>	S	M	L

# Job Safety Analysis (JSA)



## Unmanned Aerial System Operations

Work Activity	Potential Hazards	Preventive Measures or Controls	Probability	Severity	RAC
Aerial Survey (continued)	Improper operating environment; collisions; flyaways	<ul style="list-style-type: none"> <li>Consult and fill out the pre-flight checklist prior to operation.</li> <li>Check for overhead hazards, such as powerlines, trees, or buildings.</li> <li>Stay clear of bird activity.</li> <li>Do not fly in high winds or rain.</li> <li>Unmanned aircraft must weigh less than 55 pounds (25 kilograms).</li> <li>Use visual line-of-sight (VLOS) only; the unmanned aircraft must remain within VLOS of the remote pilot in command and the person manipulating the flight controls. Alternatively, the unmanned aircraft must remain within VLOS of the visual observer.</li> </ul>	S	M	L
	Improper operating environment; collisions; flyaways (continued)	<ul style="list-style-type: none"> <li>At all times the small unmanned aircraft must remain close enough to the remote pilot in command and the person manipulating the flight controls of the small unmanned aircraft for those people to be capable of seeing the aircraft with vision unaided by any device other than corrective lenses.</li> <li>Small unmanned aircraft may not operate over any persons not directly participating in the operation, under a covered structure, or inside a covered stationary vehicle.</li> <li>Operate in daylight conditions only, or civil twilight (30 minutes before official sunrise to 30 minutes after official sunset, local time) with appropriate anti-collision lighting.</li> <li>Yield right of way to other aircraft.</li> <li>May use visual observer (VO) but not required.</li> <li>Maximum allowable ground speed is 100 miles per hour (87 knots).</li> <li>Maximum allowable altitude is 400 feet above ground level (AGL) or, if higher than 400 feet AGL, must remain within 400 feet of a structure.</li> <li>Minimum weather visibility should be 3 miles from control station.</li> <li>Operations in Class G airspace are allowed without Air Traffic Control (ATC) permission; operations in Class B, C, D, and E airspace are allowed with the required ATC permission.</li> <li>No person may act as a remote pilot in command or VO for more than one unmanned aircraft operation at one time.</li> <li>Do not operate unmanned aircraft from a moving vehicle.</li> <li>Both the operating environment and the small unmanned aircraft require pre-flight inspection by the remote pilot in command.</li> <li>A person may not operate a small unmanned aircraft if that person has any physical or mental condition that would interfere with safe operation.</li> <li>Do not operate under the influence of drugs or alcohol.</li> <li>Most of the restrictions discussed above are waivable if the applicant demonstrates that the operation can safely be conducted under the terms of a certificate of waiver.</li> </ul>			



# Job Safety Analysis (JSA)



## Unmanned Aerial System Operations

Work Activity	Potential Hazards	Preventive Measures or Controls	Probability	Severity	RAC
Aerial Survey (continued)	General	<ul style="list-style-type: none"> <li>Consult the JSA for general field activities with respect to slips, trips, and falls, heat and cold stress, adverse weather, biological hazards, and noise exposure.</li> </ul>	S	M	L
	Loss of communication	<ul style="list-style-type: none"> <li>Maintain the ability to communicate with the remote pilot at all times; use two-way radios if not near enough to the remote pilot to allow unaided verbal communication.</li> </ul>	S	M	L

### 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.

Attachment B-3  
Safety Data Sheets (SDS)

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

Product name : ALCONOX(R) DETERGENT

Product Number : Z742914  
Brand : 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 STATESTelephone : +1 314 771-5765  
Fax : +1 800 325-5052**1.4 Emergency telephone**Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-  
527-3887 CHEMTREC (International) 24  
Hours/day; 7 Days/week**SECTION 2: Hazards identification****2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Skin irritation (Category 2), H315

Serious eye damage (Category 1), H318

Specific target organ toxicity - repeated exposure (Category 2), Respiratory Tract, 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

Danger



Hazard statement(s)	
H315	Causes skin irritation.
H318	Causes serious eye damage.
H373	May cause damage to organs (Respiratory Tract) through prolonged or repeated exposure.
H402	Harmful to aquatic life.
Precautionary statement(s)	
P260	Do not breathe dust.
P264	Wash skin thoroughly after handling.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
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.
P314	Get medical advice/ attention if you feel unwell.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P501	Dispose of contents/ container to an approved waste disposal plant.

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## SECTION 3: Composition/information on ingredients

### 3.2 Mixtures

Component	Classification	Concentration
<b>n-alkylbenzenesulfonic acid, sodium salts</b>		
CAS-No. 68411-30-3 EC-No. 270-115-0 Registration number 01-2119489428-22-XXXX	Acute Tox. 4; Skin Irrit. 2; Eye Dam. 1; Aquatic Acute 2; Aquatic Chronic 3; H302, H315, H318, H401, H412	>= 10 - < 20 %
<b>sodium carbonate</b>		
CAS-No. 497-19-8 EC-No. 207-838-8 Index-No. 011-005-00-2 Registration number 01-2119485498-19-XXXX	Eye Irrit. 2A; H319	>= 10 - < 20 %
<b>tetrasodium diphosphate</b>		
CAS-No. 7722-88-5 EC-No. 231-767-1 Registration number 01-2119489794-17-XXXX	Acute Tox. 4; Eye Dam. 1; H302, H318	>= 10 - < 20 %
<b>Sulfuric acid, mono-C12-14-alkyl esters, sodium salts</b>		
CAS-No. 85586-07-8	Aquatic Acute 2; Aquatic	>= 1 - < 5 %

Aldrich - Z742914

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EC-No.	287-809-4	Chronic 3; H401, H412	
<b>Ethylenedinitrilotetraacetic acid, Tetrasodiumsalt</b>			
CAS-No.	64-02-8	Acute Tox. 4; Eye Dam. 1;	≥ 1 - < 5 %
EC-No.	200-573-9	STOT RE 2; H302, H332,	
Index-No.	607-428-00-2	H318, H373	
Registration number	01-2119486762-27-XXXX		

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. 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

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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

Carbon oxides

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

Oxides of phosphorus

Sodium oxides

Mixture with combustible ingredients.

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.

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## 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
tetrasodium diphosphate	7722-88-5	TWA	5 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
		PEL	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). Tightly fitting safety goggles

##### 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

protective clothing

##### Respiratory protection

Recommended Filter type: Filter type P2



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
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	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

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

### 10.2 Chemical stability

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

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to avoid

no information available

### 10.5 Incompatible materials

Strong oxidizing agents

### 10.6 Hazardous decomposition products

In the event of fire: see section 5

---

## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

#### Mixture

#### Acute toxicity

Oral: No data available

Inhalation: No data available

Dermal: No data available

#### Skin corrosion/irritation

Remarks: Mixture causes skin irritation.

#### Serious eye damage/eye irritation

Remarks: Mixture causes serious eye damage.

#### Respiratory or skin sensitization

No data available

#### Germ cell mutagenicity

No data available

#### Carcinogenicity

Aldrich - Z742914

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- 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**

Mixture may cause damage to organs through prolonged or repeated exposure.

- Respiratory Tract

**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.

Handle in accordance with good industrial hygiene and safety practice.

**Components**

**n-alkylbenzenesulfonic acid, sodium salts**

**Acute toxicity**

LD50 Oral - Rat - male and female - 1,080 mg/kg

(OECD Test Guideline 401)

Inhalation: No data available

LD50 Dermal - Rat - male and female - > 2,000 mg/kg

(OECD Test Guideline 402)

**Skin corrosion/irritation**

Skin - Rabbit

Result: irritating - 4 h

(OECD Test Guideline 404)

**Serious eye damage/eye irritation**

Eyes - Rabbit

Result: Irreversible effects on the eye - 72 h

(OECD Test Guideline 405)

**Respiratory or skin sensitization**

Maximization Test - Guinea pig



Result: Does not cause skin sensitization.  
(OECD Test Guideline 406)

**Germ cell mutagenicity**

Test Type: In vitro mammalian cell gene mutation test

Result: negative

Test Type: Ames test

Test system: Salmonella typhimurium

Result: negative

Test Type: Mutagenicity (mammal cell test): chromosome aberration.

Result: Positive results were obtained in some in vitro tests.

Species: Mouse - male - Bone marrow

Result: negative

Remarks: (ECHA)

**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

**sodium carbonate**

**Acute toxicity**

LD50 Oral - Rat - male and female - 2,800 mg/kg

Remarks: (ECHA)

Inhalation: No data available

LD50 Dermal - Rabbit - > 2,000 mg/kg

(US-EPA)

**Skin corrosion/irritation**

Skin - Rabbit

Result: No skin irritation - 4 h

(OECD Test Guideline 404)

**Serious eye damage/eye irritation**

Eyes - Rabbit

Result: Eye irritation

(US-EPA)

**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**

No data available

**Aspiration hazard**

No data available

**tetrasodium diphosphate****Acute toxicity**

LD50 Oral - Rat - female - > 300 - < 2,000 mg/kg

(OECD Test Guideline 420)

LC50 Inhalation - Rat - male and female - 4 h - > 0.58 mg/l - dust/mist

(OECD Test Guideline 403)

Remarks: (highest concentration to be prepared)

The value is given in analogy to the following substances: Disodium pyrophosphate

LD50 Dermal - Rabbit - male and female - > 2,000 mg/kg

(US-EPA)

**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 - 4 h

(OECD Test Guideline 405)

**Respiratory or skin sensitization**

Local lymph node assay (LLNA) - Mouse

Result: negative

(OECD Test Guideline 429)

Remarks: The value is given in analogy to the following substances: Disodium pyrophosphate

**Germ cell mutagenicity**

Test Type: gene mutation test

Test system: Mouse lymphoma test

Result: negative

Test Type: Micronucleus test

Test system: lymphocyte

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

**Sulfuric acid, mono-C12-14-alkyl esters, sodium salts****Acute toxicity**

LD50 Oral - Rat - female - > 2,000 mg/kg  
(OECD Test Guideline 420)

Inhalation: No data available

LD50 Dermal - Rat - > 2,000 mg/kg  
(OECD Test Guideline 402)

**Skin corrosion/irritation**

Remarks: No data available

**Serious eye damage/eye irritation**

Remarks: No data available

**Respiratory or skin sensitization**

- Rabbit

Does not cause skin sensitization.  
(OECD Test Guideline 406)

**Germ cell mutagenicity**

Test Type: Ames test

Test system: *S. 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****Aspiration hazard**

No data available

**Ethylenedinitrilotetraacetic acid, Tetrasodiumsalt****Acute toxicity**

LD50 Oral - Rat - female - 1,780 mg/kg

Remarks: (ECHA)

Inhalation: No data available

Dermal: No data available

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: Risk of serious damage to eyes.  
(OECD Test Guideline 405)

Remarks: (Regulation (EC) No 1272/2008, Annex VI)

**Respiratory or skin sensitization**

Maximization Test - Guinea pig

Result: negative

(OECD Test Guideline 406)

Remarks: The value is given in analogy to the following substances:  
Ethylenedinitrilotetraacetic acid disodium salt

**Germ cell mutagenicity**

Test Type: Ames test

Test system: Escherichia coli/Salmonella typhimurium

Result: negative

Remarks: (in analogy to similar products)

Test Type: In vitro mammalian cell gene mutation test

Test system: mouse lymphoma cells

Result: negative

Remarks: (in analogy to similar products)

(ECHA)

Test Type: Chromosome aberration test in vitro

Test system: Chinese hamster ovary cells

Result: negative

Remarks: (in analogy to similar products)

(ECHA)

Method: OECD Test Guideline 474

Species: Mouse - male - Bone marrow

Result: negative

Remarks: (in analogy to similar products)

The value is given in analogy to the following substances: Ethylenedinitrilotetraacetic acid disodium salt

**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.

- Respiratory Tract

**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

##### n-alkylbenzenesulfonic acid, sodium salts

Toxicity to fish static test LC50 - Lepomis macrochirus (Bluegill sunfish) - 1.67 mg/l - 96 h (US-EPA)

Toxicity to daphnia and other aquatic invertebrates static test EC50 - Daphnia magna (Water flea) - 2.9 mg/l - 48 h (OECD Test Guideline 202)

Toxicity to algae static test ErC50 - Pseudokirchneriella subcapitata (green algae) - 235 mg/l - 72 h  
Remarks: (ECHA)

Toxicity to fish(Chronic toxicity) flow-through test NOEC - Oncorhynchus tshawytscha (chinook salmon) - 0.23 mg/l - 72 d (OECD Test Guideline 210)

Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity) flow-through test NOEC - Daphnia magna (Water flea) - 1.18 mg/l - 21 d (OECD Test Guideline 211)

##### sodium carbonate

Toxicity to fish static test LC50 - Lepomis macrochirus (Bluegill sunfish) - 300 mg/l - 96 h  
Remarks: (ECHA)



Toxicity to daphnia and other aquatic invertebrates      semi-static test EC50 - Ceriodaphnia (water flea) - 220 - 227 mg/l - 48 h  
Remarks: (ECHA)

### **tetrasodium diphosphate**

Toxicity to fish      semi-static test LC50 - Oncorhynchus mykiss (rainbow trout) - > 100 mg/l - 96 h  
(OECD Test Guideline 203)

Toxicity to daphnia and other aquatic invertebrates      static test EC50 - Daphnia magna (Water flea) - > 100 mg/l - 48 h  
(US-EPA)

Toxicity to algae      static test ErC50 - Desmodesmus subspicatus (green algae) - > 100 mg/l - 72 h  
(OECD Test Guideline 201)

static test NOEC - Desmodesmus subspicatus (green algae) - > 100 mg/l - 72 h  
(OECD Test Guideline 201)

Toxicity to bacteria      static test EC50 - activated sludge - > 1,000 mg/l - 3 h  
(OECD Test Guideline 209)  
Remarks: The value is given in analogy to the following substances: dipotassium hydrogen phosphate

### **Sulfuric acid, mono-C12-14-alkyl esters, sodium salts**

Toxicity to daphnia and other aquatic invertebrates      static test EC50 - Daphnia magna (Water flea) - 2.9 mg/l - 48 h  
(OECD Test Guideline 202)

Toxicity to algae      EC50 - Pseudokirchneriella subcapitata (green algae) - 29 mg/l - 96 h  
(US-EPA)

Toxicity to bacteria      static test EC50 - activated sludge - 220 mg/l - 3 h  
(OECD Test Guideline 209)

Toxicity to fish(Chronic toxicity)      NOEC - Pimephales promelas (fathead minnow) - 0.96 mg/l - 196 d

Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity)      flow-through test LC50 - Daphnia magna (Water flea) - 1.67 mg/l - 21 d  
(OECD Test Guideline 211)

### **Ethylenedinitrilotetraacetic acid, Tetrasodiumsalt**

Toxicity to fish      static test LC50 - Oncorhynchus mykiss (rainbow trout) - > 100 mg/l - 96 h  
(OECD Test Guideline 203)

Toxicity to daphnia      static test EC50 - Daphnia magna (Water flea) - > 114 mg/l -





and other aquatic invertebrates	48 h (OECD Test Guideline 202)
Toxicity to bacteria	static test EC10 - activated sludge - > 500 mg/l - 30 min (OECD Test Guideline 209) Remarks: (in analogy to similar products) The value is given in analogy to the following substances: Ethylenedinitrilotetraacetic acid disodium salt The value is given in analogy to the following substances: Sodium feredetate
Toxicity to fish(Chronic toxicity)	flow-through test NOEC - Danio rerio (zebra fish) - >= 35.1 mg/l - 35 d (OECD Test Guideline 210) Remarks: The value is given in analogy to the following substances: Sodium calcium edetate hydrate
Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity)	semi-static test NOEC - Daphnia magna (Water flea) - 25 mg/l - 21 d Remarks: The value is given in analogy to the following substances: Ethylenedinitrilotetraacetic acid disodium salt

---

## 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

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

### Massachusetts Right To Know Components

	CAS-No.	Revision Date
pentasodium triphosphate	7758-29-4	1993-04-24
	7722-88-5	1993-02-16
tetrasodium diphosphate		

### Pennsylvania Right To Know Components

	CAS-No.	Revision Date
pentasodium triphosphate	7758-29-4	1993-04-24
	7722-88-5	1993-02-16
tetrasodium diphosphate		

---

## 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: 8.3

Revision Date: 10/15/2023

Print Date: 11/04/2023



## SAFETY DATA SHEET

Version 6.11  
Revision Date 08/04/2023  
Print Date 11/04/2023**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Iron(III) chloride

Product Number : 157740  
Brand : SIGALD  
CAS-No. : 7705-08-0**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 STATESTelephone : +1 314 771-5765  
Fax : +1 800 325-5052**1.4 Emergency telephone**Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-  
527-3887 CHEMTREC (International) 24  
Hours/day; 7 Days/week**SECTION 2: Hazards identification****2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**Corrosive to Metals (Category 1), H290  
Acute toxicity, Oral (Category 4), H302  
Skin irritation (Category 2), H315  
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

SIGALD - 157740

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Hazard statement(s)	
H290	May be corrosive to metals.
H302	Harmful if swallowed.
H315	Causes skin irritation.
H318	Causes serious eye damage.
Precautionary statement(s)	
P234	Keep only in original container.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P280	Wear protective gloves/ eye protection/ face protection.
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.
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.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P390	Absorb spillage to prevent material damage.
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 - none

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Synonyms	: Ferric chloride
Formula	: $\text{Cl}_3\text{Fe}$
Molecular weight	: 162.20 g/mol
CAS-No.	: 7705-08-0
EC-No.	: 231-729-4

Component	Classification	Concentration
<b>iron(III) chloride</b>		
	Met. Corr. 1; Acute Tox. 4; Skin Irrit. 2; Eye Dam. 1; H290, H302, H315, H318 Concentration limits: >= 1 %: Met. Corr. 1, H290;	<= 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

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

Hydrogen chloride gas

Iron 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: 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**

Store under inert gas. No metal containers.

Tightly closed. Dry.

hygroscopic

#### **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
iron(III) chloride	7705-08-0	TWA	1 mg/m <sup>3</sup>	USA. ACGIH Threshold Limit Values (TLV)
		TWA	1 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
		PEL	1 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 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

Recommended Filter type: Filter B-(P2)

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: dark, brown, to, black                   |
| b) Odor   | pungent  |
| c) Odor Threshold                               | No data available  |
| d) pH   | No data available  |
| e) Melting point/freezing point                 | Melting point: 306 °C (583 °F) - (ECHA)                        |
| f) Initial boiling point and boiling range      | Decomposes below the boiling point.                            |
| g) Flash point                                  | ( )Not applicable  |
| h) Evaporation rate                             | No data available  |
| i) Flammability (solid, gas)                    | does not ignite - A.10. (Regulation (EC) No 440/2008, Annex A) |
| j) Upper/lower flammability or explosive limits | No data available  |
| k) Vapor pressure                               | < 1 hPa at 20 °C (68 °F)                                       |
| l) Vapor density                                | 5.60 - (Air = 1.0)   |
| m) Density                                      | 2.800 g/cm <sup>3</sup> at 25 °C (77 °F)                       |
| Relative density                                | 2.8925 °C  |
| n) Water solubility                             | soluble  |
| o) Partition coefficient: n-octanol/water       | Not applicable for inorganic substances                        |
| p) Autoignition temperature                     | No data available  |
| q) Decomposition temperature                    | 316 °C (601 °F) -  |
| r) Viscosity                                    | No data available  |
| s) Explosive properties                         | No data available  |
| t) Oxidizing properties                         | none   |

### **9.2 Other safety information**

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Relative vapor density 5.60 - (Air = 1.0)

---

## 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:

Alkali metals

Ethylene oxide

Violent reactions possible with:

Aluminum

with

Heat.

Copper

metals

Light metals

Generates dangerous gases or fumes in contact with:

Water

### 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 - Mouse - female - 1,300 mg/kg

Remarks: (ECHA)

Inhalation: No data available

LD50 Dermal - Rat - male and female - > 2,000 mg/kg

(OECD Test Guideline 402)

Remarks: (in analogy to similar products)

The value is given in analogy to the following substances: iron dichloride

No data available

### **Skin corrosion/irritation**

Skin - Rabbit

Result: Irritating to skin. - 4 h

(OECD Test Guideline 404)

Remarks: (in analogy to similar products)

The value is given in analogy to the following substances: Ferrous sulfate heptahydrate  
The value is given in analogy to the following substances: Iron(II) sulphate

### **Serious eye damage/eye irritation**

Eyes - Rabbit

Result: Causes serious eye damage.

(OECD Test Guideline 405)

Remarks: (in analogy to similar products)

The value is given in analogy to the following substances: iron dichloride

### **Respiratory or skin sensitization**

Local lymph node assay (LLNA) - Mouse

Result: negative

(OECD Test Guideline 429)

Remarks: (in analogy to similar products)

### **Germ cell mutagenicity**

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

The value is given in analogy to the following substances: Ferrous sulfate heptahydrate

Test Type: Mutagenicity (mammal cell test): micronucleus.

Test system: Chinese hamster lung cells

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 487

Result: negative

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 vivo micronucleus test

Species: Mouse

Application Route: Oral

Result: negative

Remarks: (ECHA)

### **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: LJ9100000

spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, Overdose of iron compounds may have a corrosive effect on the gastrointestinal mucosa and be followed by necrosis, perforation, and stricture formation. Several hours may elapse before symptoms that can include epigastric pain, diarrhea, vomiting, nausea, and hematemesis occur. After apparent recovery a person may experience metabolic acidosis, convulsions, and coma hours or days later. Further complications may develop leading to acute liver necrosis that can result in death due to hepatic coma.

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**

Biodegradability Result: - Readily biodegradable.

**12.3 Bioaccumulative potential**

No data available

**12.4 Mobility in soil**

No data available

**12.5 Results of PBT and vPvB assessment**

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

**12.6 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: 1773 Class: 8 Packing group: III  
Proper shipping name: Ferric chloride, anhydrous  
Reportable Quantity (RQ): 1000 lbs  
Poison Inhalation Hazard: No

**IMDG**

UN number: 1773 Class: 8 Packing group: III EMS-No: F-A, S-B  
Proper shipping name: FERRIC CHLORIDE, ANHYDROUS  
Marine pollutant : yes

**IATA**

UN number: 1773 Class: 8 Packing group: III  
Proper shipping name: Ferric chloride, anhydrous

---

**SECTION 15: Regulatory information****SARA 302 Components**

This material does not contain any components with a section 302 EHS TPQ.

**SARA 313 Components**

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

**SARA 311/312 Hazards**

Acute Health Hazard

**Massachusetts Right To Know Components**

	CAS-No.	Revision Date
iron(III) chloride	7705-08-0	1993-02-16

**Pennsylvania Right To Know Components**

	CAS-No.	Revision Date
iron(III) chloride	7705-08-0	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: 6.11

Revision Date: 08/04/2023

Print Date: 11/04/2023

# SAFETY DATA SHEET

Version 6.11  
Revision Date 08/23/2023  
Print Date 11/04/2023

## 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

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### SECTION 3: Composition/information on ingredients

#### 3.1 Substances

Synonyms	:	Divanadium pentaoxide Pentaoxodivanadium 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. 1314-62-1	Revision Date 1989-08-11
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**SARA 313 Components**

vanadium pentoxide	CAS-No. 1314-62-1	Revision Date 1989-08-11
--------------------	----------------------	-----------------------------

The following components are subject to reporting levels established by SARA Title III, Section 313:

vanadium pentoxide	CAS-No. 1314-62-1	Revision Date 1989-08-11
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**SARA 311/312 Hazards**

Acute Health Hazard, Chronic Health Hazard

**Massachusetts Right To Know Components**

vanadium pentoxide	CAS-No. 1314-62-1	Revision Date 1989-08-11
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**Pennsylvania Right To Know Components**

vanadium pentoxide	CAS-No. 1314-62-1	Revision Date 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. 1314-62-1	Revision Date 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

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Version: 6.11

Revision Date: 08/23/2023

Print Date: 11/04/2023

## SAFETY DATA SHEET

Version 6.8  
Revision Date 01/26/2023  
Print Date 11/04/2023**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Selenium

Product Number : 229865  
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/ 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.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/ doctor. 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; Aquatic Chronic 4; H301, 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/m <sup>3</sup>	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.2 mg/m <sup>3</sup>	USA. ACGIH Threshold Limit Values (TLV)
		TWA	0.2 mg/m <sup>3</sup>	USA. Table Z-1-A Limits for Air Contaminants (1989 vacated values)
		TWA	0.2 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
		PEL	0.2 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. 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 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 (OECD Test Guideline 203) 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 (OECD Test Guideline 202) Remarks: (above the solubility limit in the test medium)
Toxicity to algae	static test ErC50 - Pseudokirchneriella subcapitata (algae) - > 100 mg/l - 72 h (OECD Test Guideline 201) Remarks: (above the solubility limit in the test medium)
Toxicity to bacteria	static test EC50 - activated sludge - > 3,200 mg/l - 3 h (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 (OECD Test Guideline 211) 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  
- 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.

---

**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: 11/04/2023

# SAFETY DATA SHEET

Version 6.4  
Revision Date 04/20/2021  
Print Date 11/04/2023

## SECTION 1: Identification of the substance/mixture and of the company/undertaking

### 1.1 Product identifiers

Product name : Magnesium oxide

Product Number : 243388  
Brand : SIGALD  
CAS-No. : 1309-48-4

### 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

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 : MgO  
Molecular weight : 40.30 g/mol  
CAS-No. : 1309-48-4  
EC-No. : 215-171-9

SIGALD - 243388

Page 1 of 8

Component	Classification	Concentration
<b>Magnesium oxide</b>		
		<= 100 %

---

## 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. 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. For this substance/mixture no limitations of extinguishing agents are given.

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

Magnesium 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

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 and moisture sensitive.

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
Magnesium oxide	1309-48-4	TWA	10 mg/m <sup>3</sup>	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Not classifiable as a human carcinogen		



		TWA	15 mg/m <sup>3</sup>	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		PEL	10 mg/m <sup>3</sup>	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		TWA	10 mg/m <sup>3</sup>	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000

## 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<br>Color: white                    |
| b) Odor   | No data available                               |
| c) Odor Threshold                               | No data available                               |
| d) pH   | No data available                               |
| e) Melting point/freezing point                 | Melting point/range: 2,852 °C (5,166 °F) - lit. |
| f) Initial boiling point and boiling range      | 3,600 °C 6,512 °F at 1,013.25 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) 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                         | 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

Exothermic reaction with:  
halogen-halogen compounds  
acids  
phosphorus pentachloride  
Risk of explosion with:  
powdered aluminium  
perchlorates  
powdered magnesium  
sulfur

### 10.4 Conditions to avoid

Air sensitive.  
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

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: OM3850000

Ingestion or inhalation of a large quantity may cause a feverish reaction and leukocytosis.,  
Diarrhea

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**

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)**

Not dangerous goods

### **IMDG**

Not dangerous goods

### **IATA**

Not dangerous goods

### **Further information**

Not classified as dangerous in the meaning of transport regulations.

---

## SECTION 15: Regulatory information

### **SARA 302 Components**

This material does not contain any components with a section 302 EHS TPQ.

### **SARA 313 Components**

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

### **SARA 311/312 Hazards**

No SARA Hazards

### **Massachusetts Right To Know Components**

No components are subject to the Massachusetts Right to Know Act.

---

## SECTION 16: Other information

### **Further information**

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](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: 04/20/2021

Print Date: 11/04/2023

## SAFETY DATA SHEET

Version 6.7  
Revision Date 02/07/2023  
Print Date 11/04/2023**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Mercury

Product Number : 261017

Brand : SIGALD

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; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H330, H360, H372, H400, H410 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 Kidney damage Substances for which there is a Biological Exposure Index or Indices (see BEI® section)		

		Not classifiable as a human carcinogen Danger of cutaneous absorption		
		TWA	0.05 mg/m <sup>3</sup>	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: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the EC approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

#### Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

#### Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face 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 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)
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) 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

**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: 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

---

**SECTION 12: Ecological information****12.1 Toxicity**

Toxicity to fish                      mortality LC50 - Cyprinus carpio (Carp) - 0.160 mg/l - 96 h

Toxicity to fish(Chronic toxicity)      Remarks: No data available  
(mercury)

**12.2 Persistence and degradability**

The methods for determining biodegradability are not applicable to inorganic substances.

**12.3 Bioaccumulative potential**

Bioaccumulation                      Carassius auratus (goldfish) - 1,789 d  
- 0.25 µg/l(mercury)

Bioconcentration factor (BCF): 155,986

**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.

Very toxic to aquatic life with long lasting effects.

No data available

---

**SECTION 13: Disposal considerations****13.1 Waste treatment methods****Product**

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

## 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

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## **SECTION 16: Other information**

### **Further information**

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](http://www.sigma-aldrich.com) and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Version: 6.7

Revision Date: 02/07/2023

Print Date: 11/04/2023

# SAFETY DATA SHEET

Version 6.9  
Revision Date 10/27/2023  
Print Date 11/04/2023

## 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

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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 %

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

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 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

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: Chunks                                    |
| b) Odor           | No data available                               |
| c) Odor Threshold | No data available                               |
| d) pH             | No data available                               |
| e) Melting        | Melting point/range: 1,278 °C (2,332 °F) - lit. |

	point/freezing point	
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
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: 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

no information available

### 10.5 Incompatible materials

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

Oral: No data available

Inhalation: No data available

Dermal: 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

Possible human carcinogen

IARC: 1 - Group 1: Carcinogenic to humans (Beryllium foil)

NTP: Known - Known to be human carcinogen  
The reference note has been added by TD based on the background information of the NTP. (Beryllium foil)

OSHA: OSHA specifically regulated carcinogen (Beryllium foil)

#### 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

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## **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:

	CAS-No.	Revision Date
Beryllium foil	7440-41-7	1989-08-11

### SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

### Massachusetts Right To Know Components

	CAS-No.	Revision Date
Beryllium foil	7440-41-7	1989-08-11

### Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Beryllium foil	7440-41-7	1989-08-11

### 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). Beryllium foil

CAS-No.	Revision Date
7440-41-7	2008-10-10

---

## 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: 10/27/2023

Print Date: 11/04/2023

# SAFETY DATA SHEET

Version 6.9  
Revision Date 05/24/2023  
Print Date 11/04/2023

## 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; Carc. 1B; Repr. 2; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H330,	<= 100 %

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	H341, H350, H361, H372, H400, H410 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. |

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 carcinogen The 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  
Remarks: (ECHA)

Toxicity to daphnia and other aquatic invertebrates static test LC50 - Daphnia magna (Water flea) - 0.11 mg/l - 48 h  
(OECD Test Guideline 202)

Toxicity to bacteria static test NOEC - activated sludge - 0.0002 mg/l - 3 h  
(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 - 1.27 µg/l(Cadmium)

**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:

Cadmium	CAS-No. 7440-43-9	Revision Date 2007-07-01
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**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
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**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 <a href="http://www.P65Warnings.ca.gov">www.P65Warnings.ca.gov</a> . Cadmium	CAS-No. 7440-43-9	Revision Date 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: 6.9

Revision Date: 05/24/2023

Print Date: 11/04/2023

# SAFETY DATA SHEET

Version 6.5  
Revision Date 07/22/2022  
Print Date 11/04/2023

## 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

Aldrich - 266299

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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: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the EC approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

#### Body Protection

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 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 and other aquatic invertebrates EC50 - Daphnia magna (Water flea) - 0.07 mg/l - 48 h

### 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:

	CAS-No.	Revision Date
chromium	7440-47-3	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**

	CAS-No.	Revision Date
chromium	7440-47-3	2007-07-01

---

**SECTION 16: Other information**

**Further information**

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Version: 6.5

Revision Date: 07/22/2022

Print Date: 11/04/2023

## SAFETY DATA SHEET

Version 6.7  
Revision Date 04/18/2021  
Print Date 11/04/2023**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 STATESTelephone : +1 314 771-5765  
Fax : +1 800 325-5052**1.4 Emergency telephone**Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-  
527-3887 CHEMTREC (International) 24  
Hours/day; 7 Days/week**SECTION 2: Hazards identification****2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**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; Aquatic Acute 3; H351, 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 Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 423.45 mg/l - 48 h Remarks: (ECOTOX Database)
Toxicity to algae	static test ErC50 - Pseudokirchneriella subcapitata (algae) - > 36.6 mg/l - 72 h (OECD Test Guideline 201)
Toxicity to bacteria	static test EC50 - activated sludge - 27 mg/l - 4 h (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:

	CAS-No.	Revision Date
antimony	7440-36-0	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: 11/04/2023

# SAFETY DATA SHEET

Version 6.8  
Revision Date 05/25/2023  
Print Date 11/04/2023

## 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



---

## 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; Resp. Sens. 1; Skin Sens. 1; Muta. 2; Carc. 1B; Repr. 1B; Aquatic Chronic 4; H228, H319, H334, H317, H341, H350, H360, 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. 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

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.

---

## 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.

---

## 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/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
		TWA	0.05 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
		TWA	0.1 mg/m <sup>3</sup>	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		PEL	0.02 mg/m <sup>3</sup>	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		TWA	0.005 mg/m <sup>3</sup>	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Respiratory sensitization Suspected human carcinogen		
		TWA	0.02 mg/m <sup>3</sup>	USA. ACGIH Threshold Limit Values (TLV)
		Dermal Sensitization Respiratory sensitization 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 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

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
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

---

## 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

---

## 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.

---

**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

---

**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: 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.

---

**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: 11/04/2023

# SAFETY DATA SHEET

Version 6.6  
Revision Date 05/25/2023  
Print Date 11/04/2023

## SECTION 1: Identification of the substance/mixture and of the company/undertaking

### 1.1 Product identifiers

Product name : Arsenic  
Product Number : 267961  
Brand : Aldrich  
Index-No. : 033-001-00-X  
CAS-No. : 7440-38-2

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

Identified uses : Laboratory chemicals, 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

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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.

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; Eye Dam. 1; Carc. 1A; Aquatic Acute 1; Aquatic Chronic 1; H301, H331, H315, H318, H350, H400, H410 M-Factor - Aquatic Acute: 10 M-Factor - 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. 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 Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed human carcinogen		
		C	0.0020 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A 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 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: 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                            |

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- |   |   |
|---|---|
| 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

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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 - Oreochromis mossambicus (Mozambique tilapia) - 28.68 mg/l - 96 h  
Remarks: (ECHA)

Toxicity to daphnia and other aquatic invertebrates static test EC50 - Bosmina longirostris (water flea) - 0.85 mg/l - 48 h  
Remarks: (ECHA)

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Toxicity to algae	static test NOEC - <i>Macrocystis pyrifera</i> (brown algae) - 0.04 mg/l - 42 h Remarks: (ECHA)
Toxicity to bacteria	static test EC50 - activated sludge - 10.6 mg/l - 10 Days Remarks: (ECHA)
Toxicity to fish(Chronic toxicity)	flow-through test NOEC - <i>Pimephales promelas</i> (fathead minnow) - 2.13 mg/l - 35 d Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity)	flow-through test NOEC - Shrimp - 0.631 mg/l - 51 d 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

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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:

	CAS-No.	Revision Date
arsenic	7440-38-2	2015-11-23

**SARA 311/312 Hazards**

Acute Health Hazard, Chronic Health Hazard

**Reportable Quantity** : D004 lbs

**Massachusetts Right To Know Components**

	CAS-No.	Revision Date
arsenic	7440-38-2	2015-11-23

**Pennsylvania Right To Know Components**

	CAS-No.	Revision Date
arsenic	7440-38-2	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.	Revision Date
	7440-38-2	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

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Version: 6.6

Revision Date: 05/25/2023

Print Date: 11/04/2023

# SAFETY DATA SHEET

Version 6.7  
Revision Date 05/25/2023  
Print Date 11/04/2023

## 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	:	Tl
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; Aquatic Acute 3; Aquatic Chronic 4; H300, H330, 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/m <sup>3</sup>	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	Skin designation		
		TWA	0.02 mg/m <sup>3</sup>	USA. ACGIH Threshold Limit Values (TLV)
		Danger of cutaneous absorption		
		TWA	0.1 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		
		PEL	0.1 mg/m <sup>3</sup>	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

## 8.2 Exposure controls

### Appropriate engineering controls

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. |

	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: 11/04/2023

## SAFETY DATA SHEET

Version 6.5  
Revision Date 08/27/2022  
Print Date 11/04/2023

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

Product name : Barium chloride  
Product Number : 342920  
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. 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 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

	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/cm <sup>3</sup> 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 (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	static test LC50 - Daphnia magna (Water flea) - 14.5 mg/l - 48 h Remarks: (ECHA) (referred to the cation)
Toxicity to algae	static test ErC50 - Pseudokirchneriella subcapitata (algae) - > 100 mg/l - 72 h (OECD Test Guideline 201)
Toxicity to bacteria	static test EC50 - activated sludge - > 943.1 mg/l - 3 h (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 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. 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: 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

Aldrich - 342920

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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: 6.5 Revision Date: 08/27/2022 Print Date: 11/04/2023

## SAFETY DATA SHEET

Version 6.8  
Revision Date 06/15/2023  
Print Date 11/04/2023**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Manganese

Product Number : 463728  
Brand : Aldrich  
CAS-No. : 7439-96-5**1.2 Relevant identified uses of the substance or mixture and uses advised against**

Identified uses : Laboratory chemicals, Synthesis of substances

**1.3 Details of the supplier of the safety data sheet**Company : Sigma-Aldrich Inc.  
3050 SPRUCE ST  
ST. LOUIS MO 63103  
UNITED STATESTelephone : +1 314 771-5765  
Fax : +1 800 325-5052**1.4 Emergency telephone**Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-  
527-3887 CHEMTREC (International) 24  
Hours/day; 7 Days/week**SECTION 2: Hazards identification****2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**Chemicals which, in contact with water, emit flammable gases (Category 1), H260  
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)	
H260	In contact with water releases flammable gases which may ignite spontaneously.
H411	Toxic to aquatic life with long lasting effects.
Precautionary statement(s)	
P223	Do not allow contact with water.
P231 + P232	Handle under inert gas. Protect from moisture.
P273	Avoid release to the environment.
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.
P391	Collect spillage.
P402 + P404	Store in a dry place. Store in a closed container.
P501	Dispose of contents/ container to an approved waste disposal plant.

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

---

## 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</b>	1; Aquatic Acute 2; Aquatic Chronic 2; H260, 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

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**

Carbon dioxide (CO<sub>2</sub>) Dry powder

**Unsuitable extinguishing media**

Water Foam

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

Manganese/manganese oxides

Combustible.

May not get in touch with: Water

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.

---

**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. 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

Keep workplace dry. Do not allow product to come into contact with water.

#### 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.

Moisture sensitive.

#### Storage class

Storage class (TRGS 510): 4.3: Hazardous materials, which set free flammable gases upon contact with water

### 7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

---

## SECTION 8: Exposure controls/personal protection

### 8.1 Control parameters

#### Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Manganese	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	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

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 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. Risk of explosion.

---

## **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: 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                                | 7.419 °C - Regulation (EC) No. 440/2008, Annex, A.3                                      |
| n) Water solubility                             | 0.001 g/l at 20 °C (68 °F) - Regulation (EC) No. 440/2008, Annex, A.6 - 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

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

Avoid moisture.

Moisture.

### 10.5 Incompatible materials

acids, Halogens, Bases, Phosphorus, Sulfur oxides, Peroxides

### 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 - dust/mist

(OECD Test Guideline 403)

Dermal: 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: No eye irritation - 72 h

(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: Chromosome aberration test in vitro

Test system: Human lymphocytes

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: Red blood cells (erythrocytes)

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**

May cause reproductive disorders.

### **Specific target organ toxicity - single exposure**

No data available

### **Specific target organ toxicity - repeated exposure**

No data available

### **Aspiration hazard**

No data available

## **11.2 Additional Information**

RTECS: 009275000

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 LC50 - Oncorhynchus mykiss (rainbow trout) - > 3.6 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - > 1.6 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to algae	static test ErC50 - Desmodesmus subspicatus (green algae) - 4.5 mg/l - 72 h (OECD Test Guideline 201)
Toxicity to bacteria	static test EC50 - activated sludge - 1,000 mg/l - 3 h (OECD Test Guideline 209)
Toxicity to fish(Chronic toxicity)	LC50 - Oncorhynchus mykiss (rainbow trout) - 0.17 - 15.61 mg/l - 28 d Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity)	static test NOEC - Ceriodaphnia dubia (water flea) - 1.7 mg/l - 8 d (OECD Test Guideline 211)

### 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: 3208 Class: 4.3 Packing group: I  
Proper shipping name: Metallic substance, water-reactive, n.o.s. (Manganese)  
Reportable Quantity (RQ):  
Poison Inhalation Hazard: No

**IMDG**

UN number: 3208 Class: 4.3 Packing group: I EMS-No: F-G, S-N  
Proper shipping name: METALLIC SUBSTANCE, WATER-REACTIVE, N.O.S. (Manganese)

**IATA**

UN number: 3208 Class: 4.3 Packing group: I  
Proper shipping name: Metallic substance, water-reactive, n.o.s. (Manganese)  
IATA Passenger: Not permitted for transport

---

**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	7439-96-5	2007-07-01

**SARA 311/312 Hazards**

Reactivity Hazard, Chronic Health Hazard

**Massachusetts Right To Know Components**

	CAS-No.	Revision Date
Manganese	7439-96-5	2007-07-01

**Pennsylvania Right To Know Components**

	CAS-No.	Revision Date
Manganese		

Aldrich - 463728

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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: 06/15/2023

Print Date: 11/04/2023

## SAFETY DATA SHEET

Version 6.4  
Revision Date 09/29/2021  
Print Date 11/04/2023**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Copper(II) oxide

Product Number : 544868  
Brand : Aldrich  
CAS-No. : 1317-38-0**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 STATESTelephone : +1 314 771-5765  
Fax : +1 800 325-5052**1.4 Emergency telephone**Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-  
527-3887 CHEMTREC (International) 24  
Hours/day; 7 Days/week**SECTION 2: Hazards identification****2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**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

Synonyms	: Cupric oxide
Formula	: CuO
Molecular weight	: 79.55 g/mol
CAS-No.	: 1317-38-0
EC-No.	: 215-269-1

Component	Classification	Concentration
<b>copper(II) oxide</b>		
	Aquatic Acute 1; Aquatic Chronic 1; H400, H410 M-Factor - Aquatic Acute: 10 - Aquatic Chronic: 10	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

---

## SECTION 4: First aid measures

### 4.1 Description of first-aid measures

#### 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

Copper 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.

#### 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
copper(II) oxide	1317-38-0	TWA	0.1 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits

### 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<br>Color: black   |
| b) Odor   | No data available  |
| c) Odor Threshold                               | No data available  |
| d) pH   | No data available  |
| e) Melting point/freezing point                 | Melting point/range: 1,336 °C (2,437 °F)   |
| f) Initial boiling point and boiling range      | No data available  |
| g) Flash point                                  | ( )Not applicable  |
| h) Evaporation rate                             | No data available  |
| i) Flammability (solid, gas)                    | 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                                      | 6.32 g/cm <sup>3</sup>   |
| Relative density                                | No data available  |
| n) Water solubility                             | 0.0001 g/l at 20 °C (68 °F) - Regulation (EC) No. 440/2008, Annex, A.6 - 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:

Aluminum

Violent reactions possible with:

Boron

hydrazine and derivatives

hydroxylamine

sodium

magnesium

Risk of ignition or formation of inflammable gases or vapours with:

hydrogen sulphide

Fluorine

silane

hydrides

Potassium

Acid anhydrides

Hydrogen

## 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 - > 2,500 mg/kg

(OECD Test Guideline 423)

Symptoms: Possible damages:, Vomiting, Pain, Diarrhea

Symptoms: Irritation symptoms in the respiratory tract.

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 - 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

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

Remarks: (in analogy to similar products)

The value is given in analogy to the following substances: Copper(II) sulphate

Test Type: unscheduled DNA synthesis assay

Species: Rat

Cell type: Liver cells

Application Route: Oral

Method: OECD Test Guideline 486

Result: negative

Remarks: (in analogy to similar products)

Test Type: Micronucleus test

Species: Mouse

Cell type: Red blood cells (erythrocytes)

Application Route: Oral

Method: Directive 67/548/EEC, Annex V, B.12.

Result: negative

Remarks: (in analogy to similar products)

### **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: GL7900000

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.

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

After uptake:

Systemic effects:

CNS disorders

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	flow-through test LC50 - Pimephales promelas (fathead minnow) - 0.193 mg/l - 96 h Remarks: (ECHA) (in analogy to similar products) The value is given in analogy to the following substances: Copper(II) sulphate
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 0.011 - 0.039 mg/l - 48 h
Toxicity to algae	static test NOEC - Phaeodactylum tricornutum - 0.0057 mg/l - 72 h (ISO 10253) Remarks: (in analogy to similar products) (above the solubility limit in the test medium) The value is given in analogy to the following substances: Copper(II) chloride dihydrate
	static test ErC50 - Skeletonema costatum (marine diatom) - 0.0238 mg/l - 72 h (ISO 10253) Remarks: (in analogy to similar products) (above the solubility limit in the test medium) The value is given in analogy to the following substances: Copper(II) chloride dihydrate

### 12.2 Persistence and degradability

The methods for determining the biological degradability 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

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)

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.  
(copper(II) oxide)  
Marine pollutant : yes

### IATA

UN number: 3077 Class: 9 Packing group: III  
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (copper(II) 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. 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.

### 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: 6.4

Revision Date: 09/29/2021

Print Date: 11/04/2023

## SAFETY DATA SHEET

Version 6.7  
Revision Date 03/29/2022  
Print Date 11/04/2023**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Zinc oxide

Product Number : 544906

Brand : Aldrich

Index-No. : 030-013-00-7

CAS-No. : 1314-13-2

**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)**

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	: OZn
Molecular weight	: 81.39 g/mol
CAS-No.	: 1314-13-2
EC-No.	: 215-222-5
Index-No.	: 030-013-00-7

Component	Classification	Concentration
<b>Zinc oxide</b>		
	Aquatic Acute 1; Aquatic Chronic 1; H400, H410 M-Factor - Aquatic Acute: 1 M-Factor - 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

#### 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

Zinc/zinc 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.

#### 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)
		TWA	10 mg/m <sup>3</sup>	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	5 mg/m <sup>3</sup>	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	5 mg/m <sup>3</sup>	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	10 mg/m <sup>3</sup>	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000

### 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<br>Color: white  |
| b) Odor                                    | odorless  |
| c) Odor Threshold                          | Not applicable  |
| d) pH                                      | 6.72  |
| e) Melting point/freezing point            | Melting point/freezing point: > 1,000 °C (> 1,832 °F) at ca.1,013.25 hPa - Regulation (EC) No. 440/2008, Annex, A.1 |
| f) Initial boiling point and boiling range | No data available   |
| g) Flash point                             | ( )Not applicable   |

h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapor pressure	No data available
l)	Vapor density	No data available
m)	Density	5.68 g/cm <sup>3</sup> at 22 °C (72 °F)
	Relative density	5.6822 °C - Regulation (EC) No. 440/2008, Annex, A.3
n)	Water solubility	0.0029 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

Violent reactions possible with:  
hydrogen peroxide  
magnesium

### 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 - > 1.79 mg/l - dust/mist

(US-EPA)

LD50 Dermal - Rat - male and female - > 2,000 mg/kg  
(OECD Test Guideline 402)

No data available

#### Skin corrosion/irritation

Skin - reconstructed human epidermis (RhE)

Result: No skin irritation - 1 h

(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

Maximization Test - Guinea pig

Result: negative

(OECD Test Guideline 406)

#### 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: Positive results were obtained in some in vitro tests.

Test Type: Chromosome aberration test in vitro

Test system: Chinese hamster lung cells

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 473

Result: negative

Test Type: Chromosome aberration test in vitro

Test system: Human lymphocytes

Metabolic activation: without metabolic activation

Result: positive

Remarks: (ECHA)

Test Type: Micronucleus test

Test system: Human epithelioid cells

Metabolic activation: without metabolic activation

Method: OECD Test Guideline 487

Result: negative

Test Type: In vivo micronucleus test  
Species: Mouse  
Cell type: Red blood cells (erythrocytes)  
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**

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  
Remarks: (in analogy to similar products)

Repeated dose toxicity - Rat - male - Inhalation - 3 Months

Repeated dose toxicity - Rat - male and female - Dermal - 28 d - LOAEL (Lowest observed adverse effect level) - 75 mg/kg

RTECS: ZH4810000

Zinc oxide dust or fume can irritate the respiratory tract. Prolonged skin contact can produce a severe dermatitis called oxide pox. Exposure to high levels of dust or fume can cause metallic taste, marked thirst, coughing, fatigue, weakness, muscular pain, and nausea followed by fever and chills. Severe overexposure may result in bronchitis or pneumonia with a bluish tint to the skin., prolonged or repeated exposure can cause:, Reversible liver enzyme abnormalities., Diarrhea  
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

The following applies to zinc compounds in general: only slightly absorbable via the gastrointestinal tract. Adstringent effect on mucous membranes. Metal-fume fever after inhalation of large quantities.

Handle in accordance with good industrial hygiene and safety practice.

---

## SECTION 12: Ecological information

### 12.1 Toxicity

Toxicity to fish	semi-static test LC50 - Danio rerio (zebra fish) - 2.525 mg/l - 96 h Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 1 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to algae	static test NOEC - Pseudokirchneriella subcapitata (microalgae) - 0.024 mg/l - 72 h (OECD Test Guideline 201)
Toxicity to bacteria	static test EC50 - activated sludge - > 1,000 mg/l - 3 h (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

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)

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. (Zinc oxide)

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 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. 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.

**SARA 313 Components**

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Zinc oxide	1314-13-2	2007-03-01

**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: 6.7

Revision Date: 03/29/2022

Print Date: 11/04/2023



## SAFETY DATA SHEET

Version 6.6  
Revision Date 08/27/2022  
Print Date 11/04/2023**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 STATESTelephone : +1 314 771-5765  
Fax : +1 800 325-5052**1.4 Emergency telephone**Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-  
527-3887 CHEMTREC (International) 24  
Hours/day; 7 Days/week**SECTION 2: Hazards identification****2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**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 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

## 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: 11/04/2023

## SAFETY DATA SHEET

Version 6.5  
Revision Date 02/07/2023  
Print Date 11/04/2023**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Nickel

Product Number : 577995  
Brand : Aldrich  
Index-No. : 028-002-01-4  
CAS-No. : 7440-02-0

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

Company : Sigma-Aldrich 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 sensitization (Category 1), H317  
Carcinogenicity (Category 2), H351  
Specific target organ toxicity - repeated exposure, Inhalation (Category 1), Lungs, H372  
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 - 577995

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Hazard statement(s)	
H317	May cause an allergic skin reaction.
H351	Suspected of causing cancer.
H372	Causes damage to organs (Lungs) through prolonged or repeated exposure if inhaled.
H412	Harmful to aquatic life with long lasting effects.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust.
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.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P333 + P313	If skin irritation or rash occurs: Get medical advice/ attention.
P363	Wash contaminated clothing before reuse.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Formula	: Ni
Molecular weight	: 58.69 g/mol
CAS-No.	: 7440-02-0
EC-No.	: 231-111-4
Index-No.	: 028-002-01-4

Component	Classification	Concentration
<b>nickel powder; [particle diameter &lt; 1 mm]</b>		
	Skin Sens. 1; Carc. 2; STOT RE 1; Aquatic Acute 3; Aquatic Chronic 3; H317, H351, H372, 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

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

Nickel/nickel 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 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. Keep away from heat and sources of ignition. Keep locked up or in an area accessible only to qualified or authorized persons.

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
nickel powder; [particle diameter < 1 mm]	7440-02-0	TWA	1.5 mg/m <sup>3</sup>	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Not suspected as a human carcinogen		

		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
		TWA	0.015 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
Potential Occupational Carcinogen				

#### Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
nickel powder; [particle diameter < 1 mm]	7440-02-0	Nickel	5 µg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			
		Nickel	30 µg/l	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 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 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: 1,455 °C (2,651 °F)
f) Initial boiling point and boiling range	2,730 °C 4,946 °F
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	1 hPa at 1,810 °C (3,290 °F)
l) Vapor density	No data available
m) Density	8.9 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	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

no information available

### 10.5 Incompatible materials

acids, Oxidizing agents, Sulfur compounds, Hydrogen gas, Oxygen, Methanol, organic solvents, Aluminum, Fluorine, Ammonia

### 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 - > 9,000 mg/kg

(OECD Test Guideline 401)

Inhalation: No data available

Dermal: No data available

No data available

#### Skin corrosion/irritation

Skin - Rabbit

Result: No skin irritation - 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

No data available

#### Germ cell mutagenicity

No data available

Test Type: gene mutation test

Test system: Chinese hamster fibroblasts

Metabolic activation: without metabolic activation

Method: OECD Test Guideline 476



Result: negative  
Test Type: Micronucleus test  
Test system: Chinese hamster fibroblasts  
Metabolic activation: with and without metabolic activation  
Method: OECD Test Guideline 487  
Result: negative

### **Carcinogenicity**

Suspected of causing cancer.

IARC: 2B - Group 2B: Possibly carcinogenic to humans (nickel powder; [particle diameter < 1 mm])

1 - Group 1: Carcinogenic to humans (nickel powder; [particle diameter < 1 mm])

2B - Group 2B: Possibly carcinogenic to humans (nickel powder; [particle diameter < 1 mm])

IARC: 2B - Group 2B: Possibly carcinogenic to humans (nickel powder; [particle diameter < 1 mm])

1 - Group 1: Carcinogenic to humans (nickel powder; [particle diameter < 1 mm])

2B - Group 2B: Possibly carcinogenic to humans (nickel powder; [particle diameter < 1 mm])

NTP: RAHC - Reasonably anticipated to be a human carcinogen (nickel powder; [particle diameter < 1 mm])

RAHC - Reasonably anticipated to be a human carcinogen (nickel powder; [particle diameter < 1 mm])

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 - Causes damage to organs through prolonged or repeated exposure.

- Lungs

### **Aspiration hazard**

No data available

## **11.2 Additional Information**

Repeated dose toxicity - Rat - male and female - Oral - 728 d - NOAEL (No observed adverse effect level) - 2.2 mg/kg - LOAEL (Lowest observed adverse effect level) - 6.7 mg/kg

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 - Oncorhynchus mykiss (rainbow trout) - 15.3 mg/l - 96 h Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates	static test LC50 - Ceriodaphnia dubia (water flea) - 0.074 mg/l - 48 h Remarks: (ECHA)
Toxicity to algae	static test EC50 - Pseudokirchneriella subcapitata (green algae) - > 81.5 - 148 mg/l - 72 h (OECD Test Guideline 201)
Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity)	semi-static test EC10 - Ceriodaphnia dubia (water flea) - > 2.8 - 53.6 µg/l - 7 d (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. 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)

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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. (nickel powder; [particle diameter < 1 mm])  
Marine pollutant : yes

**IATA**

UN number: 3089 Class: 4.1 Packing group: II  
Proper shipping name: Metal powder, flammable, 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, 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: 6.5

Revision Date: 02/07/2023

Print Date: 11/04/2023

# SAFETY DATA SHEET

Version 6.6  
Revision Date 05/24/2023  
Print Date 11/04/2023

## SECTION 1: Identification of the substance/mixture and of the company/undertaking

### 1.1 Product identifiers

Product name : Calcium silicate

Product Number : 742503  
Brand : Aldrich  
CAS-No. : 1344-95-2

### 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

Not a hazardous substance or mixture.

### 2.2 GHS Label elements, including precautionary statements

No hazard pictogram, no signal word, no hazard statement(s), no precautionary statement(s) required

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Formula : Ca.SiO3  
Aldrich - 742503

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CAS-No. : 1344-95-2  
EC-No. : 215-710-8

Component	Classification	Concentration
<b>Silicic acid, calcium salt</b>		
		<= 100 %

---

## 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**

Water Foam Carbon dioxide (CO<sub>2</sub>) Dry powder 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

Calcium oxide

silicon oxides

Not combustible.

Combustible.

Development of hazardous combustion gases or vapours possible in the event of fire.

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. 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
Silicic acid, calcium salt	1344-95-2	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
		TWA	5 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
		TWA	10 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
		PEL	10 mg/m <sup>3</sup>	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		PEL	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. 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

#### Respiratory protection

required when dusts are generated.

Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

#### Control of environmental exposure

Do not let product enter drains.

---

## SECTION 9: Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

- |                                 |                   |
|---------------------------------|-------------------|
| a) Appearance                   | Form: solid       |
| b) Odor                         | No data available |
| c) Odor Threshold               | No data available |
| d) pH                           | No data available |
| e) Melting point/freezing point | No data available |

f)	Initial boiling point and boiling range	No data available
g)	Flash point	( )Not applicable
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapor pressure	No data available
l)	Vapor density	No data available
m)	Density	2.900 g/cm <sup>3</sup>
	Relative density	No data available
n)	Water solubility	0.26 g/l at 20 °C (68 °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

No data available

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

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

### 10.2 Chemical stability

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

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to avoid

no information available

### 10.5 Incompatible materials

Strong oxidizing agents



## 10.6 Hazardous decomposition products

In the event of fire: see section 5

---

## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

#### Acute toxicity

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

Test Type: Chromosome aberration test in vitro

Test system: Other cell types

Method: OECD Test Guideline 473

Result: negative

Species: in vivo assay

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

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

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## 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

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)

Not dangerous goods

### IMDG

Not dangerous goods

### IATA

Not dangerous goods

### Further information

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Not classified as dangerous in the meaning of transport regulations.

---

## SECTION 15: Regulatory information

### SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

### SARA 313 Components

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

### SARA 311/312 Hazards

No SARA Hazards

### Massachusetts Right To Know Components

	CAS-No.	Revision Date
Silicic acid, calcium salt	1344-95-2	1994-04-01

### Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Silicic acid, calcium salt	1344-95-2	1994-04-01

---

## 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: 05/24/2023

Print Date: 11/04/2023



# SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006

Version 8.2  
Revision Date 24.04.2023  
Print Date 08.11.2023

GENERIC EU MSDS - NO COUNTRY SPECIFIC DATA - NO OEL DATA

## SECTION 1: Identification of the substance/mixture and of the company/undertaking

### 1.1 Product identifiers

Product name : Aluminum

Product Number : GF98718935

Brand : Aldrich

REACH No. : A registration number is not available for this substance as the substance or its uses are exempted from registration, the annual tonnage does not require a registration or the registration is envisaged for a later registration deadline.

CAS-No. : 7429-90-5

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

Identified uses : Laboratory chemicals, Manufacture of substances

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

Company : Sigma-Aldrich 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 according to Regulation (EC) No 1272/2008.

### 2.2 Label elements

Not a hazardous substance or mixture according to Regulation (EC) No 1272/2008.

### 2.3 Other hazards

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

---

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Formula : Al  
Molecular weight : 26,98 g/mol  
CAS-No. : 7429-90-5

No components need to be disclosed according to the applicable regulations.

---

## SECTION 4: First aid measures

### 4.1 Description of first-aid measures

#### If inhaled

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

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**

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.

#### **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**

### **8.2 Exposure controls**

#### **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

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.

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.

### **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) Physical state                               | solid                         |
| b) Color  | No data available             |
| c) Odor   | No data available             |
| d) Melting point/freezing point                 | No data available             |
| e) Initial boiling point and boiling range      | No data available             |
| f) Flammability (solid, gas)                    | The product is not flammable. |
| g) Upper/lower flammability or explosive limits | No data available             |
| h) Flash point                                  | Not applicable                |

- |   |  |
|---|--|
| i) Autoignition temperature               | No data available  |
| j) Decomposition temperature              | No data available  |
| k) pH                                     | No data available  |
| l) Viscosity                              | Viscosity, kinematic: No data available<br>Viscosity, dynamic: No data available |
| m) Water solubility                       | No data available  |
| n) Partition coefficient: n-octanol/water | Not applicable for inorganic substances  |
| o) Vapor pressure                         | No data available  |
| p) Density                                | No data available  |
| Relative density                          | No data available  |
| q) Relative vapor density                 | No data available  |
| r) Particle characteristics               | 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

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

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

### 11.2 Additional Information

#### Endocrine disrupting properties

##### Product:

Assessment

The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

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

The methods for determining biodegradability are not applicable to inorganic substances.



---

## SECTION 15: Regulatory information

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

This material safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006.

#### Authorisations and/or restrictions on use

Regulation (EU) 2019/1148 on the marketing and use of explosives precursors : Aluminium (bulk)

### 15.2 Chemical Safety Assessment

For this product a chemical safety assessment was not carried out

---

## SECTION 16: Other information

### Full text of other abbreviations

ADN - European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways; ADR - Agreement concerning the International Carriage of Dangerous Goods by Road; AIIC - Australian Inventory of Industrial Chemicals; ASTM - American Society for the Testing of Materials; bw - Body weight; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECS - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; n.o.s. - Not Otherwise Specified; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RID - Regulations concerning the International Carriage of Dangerous Goods by Rail; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TECI - Thailand Existing Chemicals Inventory; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative

**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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## SAFETY DATA SHEET

Version 6.11  
Revision Date 05/24/2023  
Print Date 11/04/2023**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Sodium hydroxide

Product Number : S5881

Brand : SIGALD

Index-No. : 011-002-00-6

CAS-No. : 1310-73-2

**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)**

Corrosive to Metals (Category 1), H290  
Skin corrosion (Category 1A), H314  
Serious eye damage (Category 1), H318  
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	Danger
Hazard statement(s)	
H290	May be corrosive to metals.
H314	Causes severe skin burns and eye damage.
H402	Harmful to aquatic life.
Precautionary statement(s)	
P234	Keep only in original container.
P260	Do not breathe dust.
P264	Wash skin thoroughly after handling.
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.
P390	Absorb spillage to prevent material damage.
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 - none

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Synonyms	: Caustic soda
Formula	: NaOH
Molecular weight	: 40.00 g/mol
CAS-No.	: 1310-73-2
EC-No.	: 215-185-5
Index-No.	: 011-002-00-6

Component	Classification	Concentration
<b>sodium hydroxide</b>		
	Met. Corr. 1; Skin Corr. 1A; Eye Dam. 1; Aquatic Acute 3; H290, H314, H318, H402 Concentration limits: >= 0.4 %: Met. Corr. 1, H290; >= 5 %: Skin Corr.	<= 100 %

	1A, H314; 2 - < 5 %: Skin Corr. 1B, H314; 0.5 - < 2 %: Skin Irrit. 2, H315; 0.5 - < 2 %: Eye Irrit. 2, H319;	
--	--	--

For the full text of the H-Statements mentioned in this Section, see Section 16.

---

## SECTION 4: First aid measures

### 4.1 Description of first-aid measures

#### General advice

First aiders need to protect themselves. Show this material safety data sheet to the doctor in attendance.

#### If inhaled

After inhalation: fresh air. Call in physician.

#### In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Call a physician immediately.

#### In case of eye contact

After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist. Remove contact lenses.

#### If swallowed

After swallowing: make victim drink water (two glasses at most), avoid vomiting (risk of perforation). Call a physician immediately. Do not attempt to neutralise.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

No data available

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

Sodium 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 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.

##### **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
sodium hydroxide	1310-73-2	C	2 mg/m <sup>3</sup>	USA. ACGIH Threshold Limit Values (TLV)
		C	2 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
		TWA	2 mg/m <sup>3</sup>	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		C	2 mg/m <sup>3</sup>	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

#### Derived No Effect Level (DNEL)

Application Area	Routes of exposure	Health effect	Value
Workers	Inhalation	Long-term local effects	1 mg/m <sup>3</sup>
Consumers	Inhalation	Long-term local effects	1 mg/m <sup>3</sup>

## 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 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

**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: pellets Color: white
b) Odor	odorless
c) Odor Threshold	Not applicable
d) pH	ca. > 14 at 100 g/l at 20 °C (68 °F)
e) Melting point/freezing point	Melting point/range: 318 °C (604 °F)
f) Initial boiling point and boiling range	1,390 °C 2,534 °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	1.38 - (Air = 1.0)
m) Density	2.13 g/cm <sup>3</sup> at 20 °C (68 °F)
Relative density	No data available
n) Water solubility	1,090 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

Relative vapor	1.38 - (Air = 1.0)
----------------	--------------------

density

---

## **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:

Acetone

Chlorine

Ethylene oxide

Fluorine

Hydrogen halides

Hydrazine hydrate

hydroxylamine

Acid anhydrides

Acrolein

Acid chlorides

Acids

sulfuric acid

Chloroform

Water

hydrogen peroxide

anhydrides

phosphides

halogen-halogen compounds

trichloroethene

can decompose violently in contact with:

Organic Substances

hydrogen sulphide

Risk of ignition or formation of inflammable gases or vapours with:

powdered aluminium

Ammonium salts

persulfates

Sodium borohydride

phosphorus

Oxides of phosphorus

Halogenated hydrocarbon

Light metals

Metals

Risk of explosion/exothermic reaction with:

Bromine

Calcium

in powder form

furfuryl alcohol

Nitromethane

Peroxides

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organic nitro compounds  
Nitriles  
Acrylic monomers  
Chloroform  
with  
Acetone  
Nitrobenzene  
with  
Methanol  
Nitrobenzene  
with  
salts  
magnesium  
Zinc  
and  
Tin  
(in the presence of atmospheric oxygen and/or moisture)

#### **10.4 Conditions to avoid**

no information available

#### **10.5 Incompatible materials**

Aluminum, brass, Metals, metal alloys, Zinc, Tin

#### **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

Symptoms: If ingested, severe burns of the mouth and throat, as well as a danger of perforation of the esophagus and the stomach.

Inhalation: No data available

Inhalation: Corrosive to respiratory system.

Symptoms: burns of mucous membranes, Cough, Shortness of breath, Possible damages:, damage of respiratory tract

Dermal: No data available

No data available

##### **Skin corrosion/irritation**

Skin - Rabbit

Result: Causes burns.

Remarks: (Regulation (EC) No 1272/2008, Annex VI)

##### **Serious eye damage/eye irritation**

Eyes - Rabbit

Result: Causes serious eye damage.

(OECD Test Guideline 405)

Remarks: (Regulation (EC) No 1272/2008, Annex VI)

Remarks: Causes serious eye damage.

### **Respiratory or skin sensitization**

Patch test: - In vitro study

Result: negative

Remarks: (ECHA)

### **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: WB4900000

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

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 - Gambusia affinis (Mosquito fish) - 125 mg/l - 96 h  
Remarks: (ECOTOX Database)

Toxicity to daphnia and other aquatic invertebrates EC50 - Ceriodaphnia (water flea) - 40.4 mg/l - 48 h  
Remarks: (ECHA)

Toxicity to bacteria EC50 - Photobacterium phosphoreum - 22 mg/l - 15 min

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Remarks: (External MSDS)

### 12.2 Persistence and degradability

The methods for determining the biological degradability 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

Harmful effect due to pH shift.  
Forms corrosive mixtures with water even if diluted.  
Neutralisation possible in waste water treatment plants.  
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: 1823 Class: 8 Packing group: II  
Proper shipping name: Sodium hydroxide, solid  
Reportable Quantity (RQ): 1000 lbs  
Poison Inhalation Hazard: No

### IMDG

UN number: 1823 Class: 8 Packing group: II EMS-No: F-A, S-B  
Proper shipping name: SODIUM HYDROXIDE, SOLID

### IATA

UN number: 1823 Class: 8 Packing group: II  
Proper shipping name: Sodium hydroxide, solid

---

**SECTION 15: Regulatory information****SARA 302 Components**

This material does not contain any components with a section 302 EHS TPQ.

**SARA 313 Components**

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

**SARA 311/312 Hazards**

Acute Health Hazard

**Massachusetts Right To Know Components**

	CAS-No.	Revision Date
sodium hydroxide	1310-73-2	

---

**SECTION 16: Other information****Further information**

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](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: 05/24/2023

Print Date: 11/04/2023

# SAFETY DATA SHEET

Version 6.4  
Revision Date 02/07/2023  
Print Date 11/04/2023

## SECTION 1: Identification of the substance/mixture and of the company/undertaking

### 1.1 Product identifiers

Product name : Chrysene

Product Number : 35754  
Brand : Sigma-Aldrich  
Index-No. : 601-048-00-0  
CAS-No. : 218-01-9

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

Identified uses : Laboratory chemicals, 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 2), H341  
Carcinogenicity (Category 1B), 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)	
H341	Suspected of causing genetic defects.
H350	May cause cancer.
H410	Very toxic to aquatic life with long lasting effects.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P273	Avoid release to the environment.
P281	Use personal protective equipment as required.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

---

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Formula	: C <sub>18</sub> H <sub>12</sub>
Molecular weight	: 228.29 g/mol
CAS-No.	: 218-01-9
EC-No.	: 205-923-4
Index-No.	: 601-048-00-0

Component	Classification	Concentration
<b>chrysene</b>	Muta. 2; Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H341, H350, H400, H410 M-Factor - Aquatic Acute: 10 M-Factor - Aquatic Chronic: 10	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

---

## SECTION 4: First aid measures

### 4.1 Description of first-aid measures

#### General advice

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**

Carbon oxides

**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
	Remarks	Confirmed animal carcinogen with unknown relevance to humans		
chrysene	218-01-9	TWA	0.2 mg/m <sup>3</sup>	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		OSHA specifically regulated carcinogen		
		TWA	0.1 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen		
		PEL	0.2 mg/m <sup>3</sup>	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

#### Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
chrysene	218-01-9	1-Hydroxypyrene	2.5 µg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			

		3-hydroxybenzo(a)pyrene		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 gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

#### Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

#### Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the EC approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

#### Body Protection

protective clothing

#### Respiratory protection

required when dusts are generated.

Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

#### Control of environmental exposure

Do not let product enter drains.

---

## SECTION 9: Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

a) Appearance	Form: solid
b) Odor	No data available
c) Odor Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 252 - 254 °C (486 - 489 °F) - lit.
f) Initial boiling point and boiling range	448 °C 838 °F - lit.
g) Flash point	( )No data available
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapor pressure	No data available
l) Vapor density	No data available
m) Density	No data available
Relative density	No data available
n) Water solubility	insoluble
o) Partition coefficient: n-octanol/water	log Pow: 5.73
p) Autoignition temperature	No data available
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

### 9.2 Other safety information

No data available

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

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

### **10.3 Possibility of hazardous reactions**

No data available

### **10.4 Conditions to avoid**

no information available

### **10.5 Incompatible materials**

Strong oxidizing agents

### **10.6 Hazardous decomposition products**

In the event of fire: see section 5

---

## **SECTION 11: Toxicological information**

### **11.1 Information on toxicological effects**

#### **Acute toxicity**

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**

In vitro tests showed mutagenic effects

Test Type: Ames test

Test system: Salmonella typhimurium

Result: positive

Remarks: (Lit.)

#### **Carcinogenicity**

Possible human carcinogen

IARC: 2B - Group 2B: Possibly carcinogenic to humans (chrysene)

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: OSHA specifically regulated carcinogen (chrysene)

#### **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: GC0700000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Property that cannot be excluded on the basis of structure- effect considerations:

Nausea

Vomiting

Risk of methaemoglobin formation with headache, cardiac dysrhythmia, drop in blood pressure, dyspnoea and spasms, principal symptom: cyanosis (blue discolouration of the blood).

This substance should be handled with particular care.

---

## 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

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: 3077 Class: 9

Packing group: III

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Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (chrysene)  
Reportable Quantity (RQ): 100 lbs  
Poison Inhalation Hazard: No

**IMDG**

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F  
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.  
(chrysene)  
Marine pollutant : yes  
Marine pollutant : no

**IATA**

UN number: 3077 Class: 9 Packing group: III  
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (chrysene)

**Further information**

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

---

**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
chrysene	218-01-9	2015-11-23

**SARA 311/312 Hazards**

Chronic Health Hazard

**Massachusetts Right To Know Components**

	CAS-No.	Revision Date
chrysene	218-01-9	2015-11-23

**Pennsylvania Right To Know Components**

	CAS-No.	Revision Date
chrysene	218-01-9	2015-11-23

	CAS-No.	Revision Date
chrysene	218-01-9	2015-11-23

**New Jersey Right To Know Components**

	CAS-No.	Revision Date
chrysene	218-01-9	2015-11-23

**California Prop. 65 Components**

	CAS-No.	Revision Date
WARNING! This product contains a chemical known in		

Sigma-Aldrich - 35754



---

**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: 11/04/2023

## SAFETY DATA SHEET

Version 6.8  
Revision Date 02/07/2023  
Print Date 11/08/2023

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

Product name : Benzo[*b*]fluoranthene  
Product Number : 48490  
Brand : Supelco  
Index-No. : 601-034-00-4  
CAS-No. : 205-99-2

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

Company : Sigma-Aldrich 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 1B), 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)  
H350 : May cause cancer.

H410	Very toxic to aquatic life with long lasting effects.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

---

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Synonyms	: 3,4-Benzofluoranthene
Formula	: C <sub>20</sub> H <sub>12</sub>
Molecular weight	: 252.31 g/mol
CAS-No.	: 205-99-2
EC-No.	: 205-911-9
Index-No.	: 601-034-00-4

Component	Classification	Concentration
<b>Benz[e]acephenanthrylene</b>	Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H350, H400, H410 M-Factor - Aquatic Acute: 10	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

---

## SECTION 4: First aid measures

### 4.1 Description of first-aid measures

#### General advice

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

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 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): 6.1C: 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	Suspected human carcinogen		
Benz[e]acephenanthrylene	205-99-2	PEL	0.2 mg/m <sup>3</sup>	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

#### Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Benz[e]acephenanthrylene	205-99-2	1-Hydroxypyrene	2.5 µg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			
		3-hydroxybenzo(a)pyrene		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 Dermatril® L

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:KCL 741 Dermatril® L

#### Body Protection

protective clothing

#### Respiratory protection

required when dusts are generated.

Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

#### Control of environmental exposure

Do not let product enter drains.

---

## SECTION 9: Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

- |                                 |   |
|---------------------------------|---|
| a) Appearance                   | Form: solid   |
| b) Odor                         | No data available                                       |
| c) Odor Threshold               | No data available                                       |
| d) pH                           | No data available                                       |
| e) Melting point/freezing point | Melting point/range: 163 - 165 °C (325 - 329 °F) - lit. |
| f) Initial boiling point        | No data available                                       |

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	and boiling range	
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	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	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

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

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

Possible human carcinogen

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

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Benz[e]acephenanthrylene)

NTP: RAHC - Reasonably anticipated to be a human carcinogen  
(Benz[e]acephenanthrylene)

OSHA: No component of this product present at levels greater than or equal to 0.1% is 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.

---

## SECTION 12: Ecological information

### 12.1 Toxicity

No data available

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## 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)

Not dangerous goods

### IMDG

UN number: 3077

Class: 9

Packing group: III

EMS-

No: F-A, S-F

Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.  
(Benz[e]acephenanthrylene)

Marine pollutant : yes

Marine pollutant : no

### IATA

UN number: 3077 Class: 9

Packing group: III

Proper shipping name: Environmentally hazardous substance, solid, n.o.s.

(Benz[e]acephenanthrylene)

### Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids. 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.

### **SARA 313 Components**

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-03-01

### **SARA 311/312 Hazards**

Chronic Health Hazard

### **Massachusetts Right To Know Components**

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-03-01

### **Pennsylvania Right To Know Components**

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-03-01

### **California Prop. 65 Components**

	CAS-No.	Revision Date
, which is/are known to the State of California to cause cancer. For more information go to <a href="http://www.P65Warnings.ca.gov">www.P65Warnings.ca.gov</a> . Benz[e]acephenanthrylene	205-99-2	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 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: 11/08/2023

# SAFETY DATA SHEET

Version 6.6  
Revision Date 02/07/2023  
Print Date 11/04/2023

## SECTION 1: Identification of the substance/mixture and of the company/undertaking

### 1.1 Product identifiers

Product name : Indeno[1,2,3-cd]pyrene

Product Number : 48499  
Brand : Supelco  
CAS-No. : 193-39-5

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

Company : Sigma-Aldrich 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

For the full text of the H-Statements mentioned in this Section, see Section 16.

### 2.2 GHS Label elements, including precautionary statements

Pictogram



Signal Word : Warning

Hazard statement(s)  
H351 : Suspected of causing cancer.

Precautionary statement(s)  
P201 : Obtain special instructions before use.

P202	Do not handle until all safety precautions have been read and understood.
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	: C <sub>22</sub> H <sub>12</sub>
Molecular weight	: 276.33 g/mol
CAS-No.	: 193-39-5
EC-No.	: 205-893-2

Component	Classification	Concentration
<b>Indeno[1,2,3-cd]pyrene</b>		
	Carc. 2; H351	<= 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

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**

#### **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 locked up or in an area accessible only to qualified or authorized persons.

### **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**

Contains no substances with occupational exposure limit values.

### **8.2 Exposure controls**

#### **Appropriate engineering controls**

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

#### **Personal protective equipment**

##### **Eye/face protection**

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

##### **Skin protection**

Handle with impervious gloves.

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: [www.kcl.de](http://www.kcl.de)).

##### **Full contact**

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:KCL 741 Dermatril® L

##### **Splash contact**

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:KCL 741 Dermatril® L

##### **Body Protection**

protective clothing

##### **Respiratory protection**

required when dusts are generated.

Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

**Control of environmental exposure**  
Do not let product enter drains.

---

**SECTION 9: Physical and chemical properties**

**9.1 Information on basic physical and chemical properties**

a) Appearance	Form: solid
b) Odor	No data available
c) Odor Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	163.6 °C (326.5 °F)
f) Initial boiling point and boiling range	No data available
g) Flash point	( )Not applicable
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) 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

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

### 10.2 Chemical stability

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

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to avoid

no information available

### 10.5 Incompatible materials

Strong oxidizing agents

### 10.6 Hazardous decomposition products

In the event of fire: see section 5

---

## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

#### Acute toxicity

Oral: No data available

Inhalation: No data available

Dermal: 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

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

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Indeno[1,2,3-cd]pyrene)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (Indeno[1,2,3-cd]pyrene)

OSHA: No component of this product present at levels greater than or equal to 0.1% is 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.

---

**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)**

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
Indeno[1,2,3-cd]pyrene	193-39-5	1993-02-16

### SARA 311/312 Hazards

Chronic Health Hazard

### Massachusetts Right To Know Components

	CAS-No.	Revision Date
Indeno[1,2,3-cd]pyrene	193-39-5	1993-02-16

### Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Indeno[1,2,3-cd]pyrene	193-39-5	1993-02-16

### California Prop. 65 Components

	CAS-No.	Revision Date
, which is/are known to the State of California to cause cancer. For more information go to <a href="http://www.P65Warnings.ca.gov">www.P65Warnings.ca.gov</a> . Indeno[1,2,3-cd]pyrene	193-39-5	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: 6.6

Revision Date: 02/07/2023

Print Date: 11/04/2023



# SAFETY DATA SHEET

Version 6.8  
Revision Date 05/25/2023  
Print Date 11/04/2023

## SECTION 1: Identification of the substance/mixture and of the company/undertaking

### 1.1 Product identifiers

Product name : Benz[*a*]anthracene  
Product Number : 48563  
Brand : Supelco  
Index-No. : 601-033-00-9  
CAS-No. : 56-55-3

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

Company : Sigma-Aldrich 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 1B), 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)	
H350	May cause cancer.
H410	Very toxic to aquatic life with long lasting effects.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

---

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Synonyms : 1,2-Benzanthracene  
Tetraphene

Formula : C<sub>18</sub>H<sub>12</sub>  
Molecular weight : 228.29 g/mol  
CAS-No. : 56-55-3  
EC-No. : 200-280-6  
Index-No. : 601-033-00-9

Component	Classification	Concentration
<b>Benz[a]anthracene</b>	Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H350, H400, H410 M-Factor - Aquatic Acute: 10 - Aquatic Chronic: 10	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

---

## SECTION 4: First aid measures

### 4.1 Description of first-aid measures

#### General advice

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

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 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): 6.1C: Combustible, acute toxic Cat.3 / toxic compounds or compounds which causing chronic effects

### **7.3 Specific end use(s)**

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

---

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

### **8.1 Control parameters**

#### **Ingredients with workplace control parameters**

Contains no substances with occupational exposure limit values.

### **8.2 Exposure controls**

#### **Appropriate engineering controls**

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

#### **Personal protective equipment**

##### **Eye/face protection**

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

##### **Skin protection**

Handle with impervious gloves.

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other

substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: [www.kcl.de](http://www.kcl.de)).

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:KCL 741 Dermatril® L

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:KCL 741 Dermatril® L

### **Body Protection**

protective clothing

### **Respiratory protection**

required when dusts are generated.

Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

### **Control of environmental exposure**

Do not let product enter drains.

---

## **SECTION 9: Physical and chemical properties**

### **9.1 Information on basic physical and chemical properties**

a) Appearance	Form: solid
b) Odor	No data available
c) Odor Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 157 - 159 °C (315 - 318 °F)
f) Initial boiling point and boiling range	437.6 °C 819.7 °F
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                                   | No data available |
| Relative density                             | No data available |
| n) Water solubility                          | No data available |
| o) Partition coefficient:<br>n-octanol/water | No data available |
| 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

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

### 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

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Dermal: No data available  
No data available

**Skin corrosion/irritation**

No data available

**Serious eye damage/eye irritation**

No data available

**Respiratory or skin sensitization**

No data available

**Germ cell mutagenicity**

No data available

**Carcinogenicity**

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

Possible human carcinogen

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Benz[a]anthracene)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (Benz[a]anthracene)

OSHA: No component of this product present at levels greater than or equal to 0.1% is 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.

---

**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

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: 3077 Class: 9 Packing group: III  
Proper shipping name: Environmentally hazardous substance, solid, n.o.s.  
(Benz[a]anthracene)  
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.  
(Benz[a]anthracene)  
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.  
(Benz[a]anthracene)

### Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

---

## 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
Benz[a]anthracene	56-55-3	1993-02-16

### SARA 311/312 Hazards

Chronic Health Hazard

### Massachusetts Right To Know Components

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	1993-02-16

### Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	1993-02-16

### 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). Benz[a]anthracene

CAS-No.	Revision Date
56-55-3	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: 11/04/2023

# SAFETY DATA SHEET

Version 6.10  
Revision Date 02/07/2023  
Print Date 10/21/2023

## SECTION 1: Identification of the substance/mixture and of the company/undertaking

### 1.1 Product identifiers

Product name : Benzo[a]pyrene  
Product Number : 48564  
Brand : Supelco  
Index-No. : 601-032-00-3  
CAS-No. : 50-32-8

### 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)

Skin sensitization (Category 1), H317  
Germ cell mutagenicity (Category 1B), H340  
Carcinogenicity (Category 1B), H350  
Reproductive toxicity (Category 1B), H360  
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)	
H317	May cause an allergic skin reaction.
H340	May cause genetic defects.
H350	May cause cancer.
H360	May damage fertility or the unborn child.
H410	Very toxic to aquatic life with long lasting effects.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray.
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.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P333 + P313	If skin irritation or rash occurs: Get medical advice/ attention.
P363	Wash contaminated clothing before reuse.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Synonyms : 3,4-Benzpyrene  
3,4-Benzopyrene  
Benzo[def]chrysene  
benzo[pqr]tetraphene

Formula : C<sub>20</sub>H<sub>12</sub>  
Molecular weight : 252.31 g/mol  
CAS-No. : 50-32-8  
EC-No. : 200-028-5  
Index-No. : 601-032-00-3

Component	Classification	Concentration
<b>benzo[a]pyrene</b>	Skin Sens. 1; Muta. 1B; Carc. 1B; Repr. 1B; Aquatic Acute 1; Aquatic Chronic 1; H317, H340, H350, H360, H400, H410 Concentration limits: >= 0.01 %: Carc. 1B, 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.

#### **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

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 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): 6.1C: 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
benzo[a]pyrene	50-32-8	TWA	0.2 mg/m <sup>3</sup>	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	OSHA specifically regulated carcinogen		



		TWA	0.1 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen		
		PEL	0.2 mg/m <sup>3</sup>	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		PEL	0.2 mg/m <sup>3</sup>	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Suspected human carcinogen		

#### Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
benzo[a]pyrene	50-32-8	1-Hydroxypyrene	2.5 µg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			
		3-hydroxybenzo(a)pyrene		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 Dermatril® L

#### Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:KCL 741 Dermatril® L

### **Body Protection**

protective clothing

### **Respiratory protection**

required when dusts are generated.

Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

### **Control of environmental exposure**

Do not let product enter drains.

---

## **SECTION 9: Physical and chemical properties**

### **9.1 Information on basic physical and chemical properties**

a) Appearance	Form: solid Color: yellow
b) Odor	weakly aromatic
c) Odor Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 177 - 180 °C (351 - 356 °F)
f) Initial boiling point and boiling range	495 °C 923 °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	No data available
l) Vapor density	No data available
m) Density	1.35 g/cm <sup>3</sup>
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

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

Skin - Mouse

Result: Mild skin irritation

Remarks: (RTECS)

#### Serious eye damage/eye irritation

No data available

#### Respiratory or skin sensitization

May cause allergic skin reaction. Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

#### Germ cell mutagenicity

May cause genetic defects.

Test Type: Ames test

Test system: Salmonella typhimurium

Metabolic activation: with and without metabolic activation

Result: positive

Remarks: (Lit.)

Test Type: Mutagenicity (mammal cell test): chromosome aberration.

Test system: Chinese hamster ovary cells

Metabolic activation: with and without metabolic activation

Result: positive

Remarks: (National Toxicology Program)

Test Type: sister chromatid exchange assay

Test system: Chinese hamster ovary cells

Metabolic activation: with and without metabolic activation

Result: positive

Remarks: (National Toxicology Program)

Test Type: Chromosome aberration test

Species: Mouse

Cell type: Bone marrow

Application Route: Intraperitoneal injection

Result: positive

Remarks: (National Toxicology Program)

### **Carcinogenicity**

Presumed to have carcinogenic potential for humans

IARC: 1 - Group 1: Carcinogenic to humans (benzo[a]pyrene)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (benzo[a]pyrene)

OSHA: OSHA specifically regulated carcinogen (benzo[a]pyrene)

### **Reproductive toxicity**

May damage the unborn child.

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**

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.

---

## **SECTION 12: Ecological information**

### **12.1 Toxicity**

Toxicity to daphnia and other aquatic invertebrates      EC50 - Daphnia magna (Water flea) - 0.25 mg/l - 48 h  
Remarks: (above the solubility limit in the test medium)  
(ECOTOX Database)

Toxicity to algae      static test ErC50 - Scenedesmus acutus - 0.005 mg/l - 72 h

Supelco - 48564

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## 12.2 Persistence and degradability

No data available

## 12.3 Bioaccumulative potential

Bioaccumulation Lepomis macrochirus (Bluegill) - 48 h  
- 0.0005 mg/l(benzo[a]pyrene)

Bioconcentration factor (BCF): 3,208

## 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.  
(benzo[a]pyrene)  
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.  
(benzo[a]pyrene)  
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.  
(benzo[a]pyrene)

### 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
benzo[a]pyrene	50-32-8	2007-03-01

### SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

### Massachusetts Right To Know Components

	CAS-No.	Revision Date
benzo[a]pyrene	50-32-8	2007-03-01

### Pennsylvania Right To Know Components

	CAS-No.	Revision Date
benzo[a]pyrene	50-32-8	2007-03-01

### 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.benzo[a]pyrene">www.P65Warnings.ca.gov.benzo[a]pyrene</a>	50-32-8	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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## SAFETY DATA SHEET

Version 6.7  
Revision Date 02/07/2023  
Print Date 11/04/2023**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Benzo[k]fluoranthene

Product Number : 392251

Brand : Aldrich

Index-No. : 601-036-00-5

CAS-No. : 207-08-9

**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)**

Carcinogenicity (Category 1B), 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)	
H350	May cause cancer.
H410	Very toxic to aquatic life with long lasting effects.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

---

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Formula	: C <sub>20</sub> H <sub>12</sub>
Molecular weight	: 252.31 g/mol
CAS-No.	: 207-08-9
EC-No.	: 205-916-6
Index-No.	: 601-036-00-5

Component	Classification	Concentration
<b>Benzo[k]fluoranthene</b>	Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H350, H400, H410 M-Factor - Aquatic Acute: 10 M-Factor - Aquatic Chronic: 10	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

---

## SECTION 4: First aid measures

### 4.1 Description of first-aid measures

#### General advice

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

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 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): 6.1C: 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
Benzo[k]fluoranthene	207-08-9	PEL	0.2 mg/m <sup>3</sup>	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

#### Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Benzo[k]fluoranthene	207-08-9	1-Hydroxypyrene	2.5 µg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			
		3-hydroxybenzo(a)pyrene		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 gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the EC approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

### Body Protection

protective clothing

### Respiratory protection

required when dusts are generated.

Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

### Control of environmental exposure

Do not let product enter drains.

---

## SECTION 9: Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

- |                   |   |
|-------------------|---|
| a) Appearance     | Form: crystalline<br>Color: yellow                      |
| b) Odor           | No data available                                       |
| c) Odor Threshold | No data available                                       |
| d) pH             | No data available                                       |
| e) Melting        | Melting point/range: 215 - 217 °C (419 - 423 °F) - lit. |

	point/freezing point	
f)	Initial boiling point and boiling range	480 °C 896 °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	No data available
l)	Vapor density	No data available
m)	Density	1.286 g/cm <sup>3</sup> at 20 °C (68 °F)
	Relative density	No data available
n)	Water solubility	insoluble
o)	Partition coefficient: n-octanol/water	log Pow: 6.188 at 25 °C (77 °F) - Potential bioaccumulation
p)	Autoignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	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

## 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: Irritating to respiratory system.

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

Presumed to have carcinogenic potential for humans

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Benzo[k]fluoranthene)

NTP: RAHC - Reasonably anticipated to be a human carcinogen  
(Benzo[k]fluoranthene)

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: DF6350000

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: 3077    Class: 9    Packing group: III  
Proper shipping name: Environmentally hazardous substance, solid, n.o.s.  
(Benzo[k]fluoranthene)  
Reportable Quantity (RQ): 5000 lbs  
Poison Inhalation Hazard: No

### IMDG

UN number: 3077    Class: 9    Packing group: III    EMS-  
No: F-A, S-F  
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.  
(Benzo[k]fluoranthene)  
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.  
(Benzo[k]fluoranthene)

### 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
Benzo[k]fluoranthene	207-08-9	1993-02-16

**SARA 311/312 Hazards**

Acute Health Hazard, Chronic Health Hazard

**Massachusetts Right To Know Components**

	CAS-No.	Revision Date
Benzo[k]fluoranthene	207-08-9	1993-02-16

**Pennsylvania Right To Know Components**

	CAS-No.	Revision Date
Benzo[k]fluoranthene	207-08-9	1993-02-16

**California Prop. 65 Components**

	CAS-No.	Revision Date
, which is/are known to the State of California to cause cancer. For more information go to <a href="http://www.P65Warnings.ca.gov">www.P65Warnings.ca.gov</a> . Benzo[k]fluoranthene	207-08-9	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 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: 02/07/2023

Print Date: 11/04/2023



# Attachment B-4

## Certifications

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# Individual User Report

## Training Summary

### Rebecca Desrosiers

Report Date : October 11,2023

Name: Rebecca Desrosiers

Completed		
Title	Completed	Expiry
2023 Driving Safety: The Basics [MARCOM_BIZ Library]	16/01/2023	16/01/2024
2023 Fire Extinguisher Training [Anchor QEA, LLC]	17/04/2023	17/04/2024
HAZWOPER 40 Hour Training [Condor Geotechnical Services, Inc.]	12/01/2001	-
HAZWOPER 8 Hour Refresher 2023 In-Person [Anchor QEA, LLC]	18/04/2023	18/04/2024
HAZWOPER Supervisor 8 Hour Initial [Anchor QEA, LLC]	29/03/2016	-
Washington L&I WAC 296-800-140 Accident Prevention Program [Anchor QEA, LLC]	17/05/2021	-
Emergency Response Plan Annual Review - Seattle	16/08/2023	16/08/2024
Workspace - Identify Safety Items	19/09/2022	-
Fieldwork Support Questionnaire	19/09/2022	-



# Individual User Report

## Training Summary

### Sasha Norwood

Report Date : October 11,2023

Name: Sasha Norwood

Completed		
Title	Completed	Expiry
2022 Driving Safety: The Basics [MARCOM_BIZ Library]	15/11/2022	15/11/2023
2022 Quarter 2 Quarterly Field Services Notes [Anchor QEA, LLC]	25/04/2022	-
2022 Quarter 3 Quarterly Field Services Notes [Anchor QEA, LLC]	28/07/2022	-
2022 Quarter 4 Quarterly Field Services Notes [Anchor QEA, LLC]	17/10/2022	-
2022 Using Fire Extinguishers Effectively [BIZ Library]	15/11/2022	15/11/2023
2023 Driving Safety: The Basics [MARCOM_BIZ Library]	15/01/2023	15/01/2024
2023 Fire Extinguisher Training [Anchor QEA, LLC]	15/01/2023	15/01/2024
Adult & Pediatric First Aid/CPR/AED [American Red Cross]	11/08/2022	11/08/2024
Distracted Driving Course [Smith System]	09/07/2018	-
HAZWOPER 40 Hour Training [National Environmental Trainers Inc.]	07/06/2013	-
HAZWOPER 8 Hour Refresher 2023 In-Person [Anchor QEA, LLC]	21/04/2023	21/04/2024

HAZWOPER Supervisor 8 Hour Initial [Safety Unlimited, Inc.]	26/12/2022	-
Medical Authorization Release Letter [Occupational Health Monitoring]	30/06/2017	-
Medical Surveillance Exam [Occupational Health Monitoring]	22/11/2022	22/11/2023
Mercury & Heavy Metals Testing [Occupational Health Monitoring]	15/10/2020	-
Vaccination HEP A&B TITERS - checks immunity for HEP A&B [Occupational Health Monitoring]	15/10/2020	-
Vaccination HEP B (1st) [Occupational Health Monitoring]	05/01/2021	-
Vaccination HEP B (2nd) [Occupational Health Monitoring]	08/02/2021	-
Vaccination Hep B Titer - check immunity to Hep B [Occupational Health Monitoring]	25/10/2021	-
Vaccination Tetanus [Occupational Health Monitoring]	15/10/2020	15/10/2030
Emergency Response Plan Annual Review - Portland	14/12/2022	14/12/2023

Attachment B-5

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)

Attachment B-6  
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.

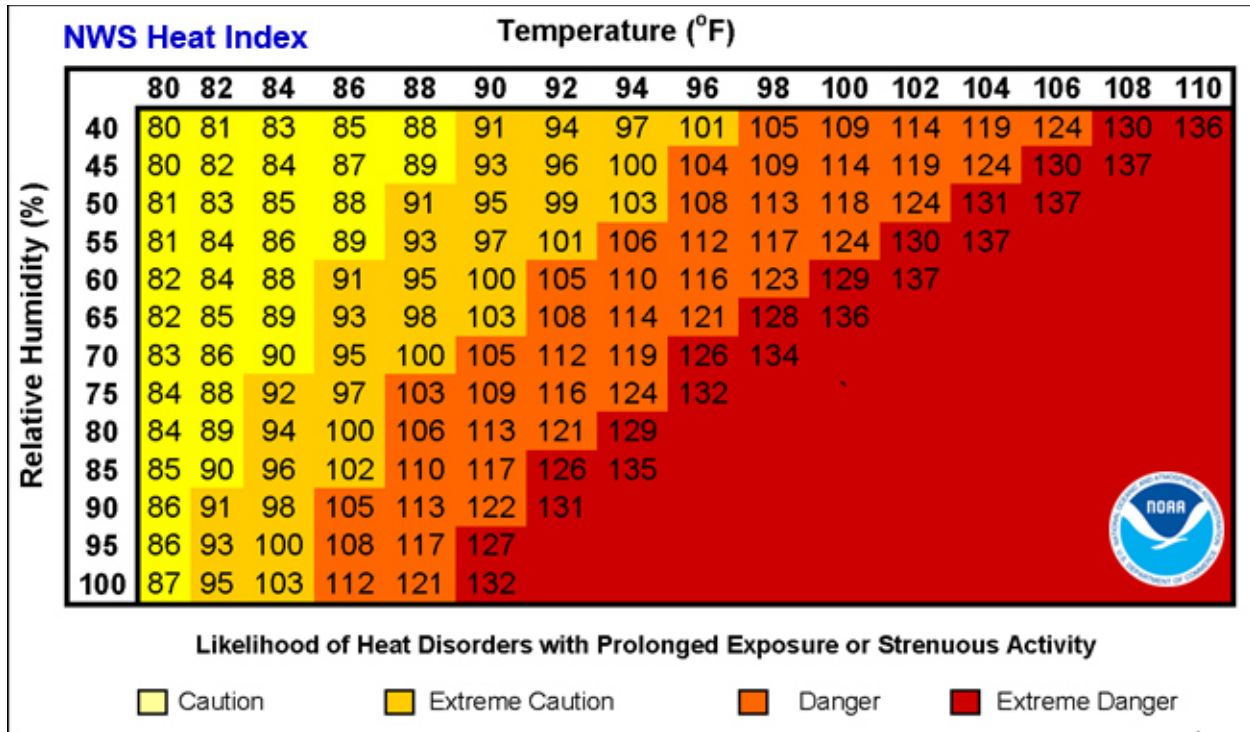
Start with light physical work and/or short durations of work time, and slowly increase each day. Increase by 20% (of the total shift) each day for non-acclimatized staff.

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# Field Program Heat Exposure Management Plan

## 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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## Field Program Heat Exposure Management Plan

- 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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# Field Program Heat Exposure Management Plan

## 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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## Field Program Heat Exposure Management Plan

- 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/OSHPubs/pubform/heat-sample-program.pdf>

<https://www.lni.wa.gov/safety-health/docs/HRIAPPAddendum.doc>

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Attachment B-7

Field Program Wildfire Management Plan

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## Field Program Wildfire Management Plan

Date: \_\_\_\_\_  
Project No: \_\_\_\_\_  
Project Name: \_\_\_\_\_

Wildfires can be a common threat in many areas of the country and we need to recognize this threat. If a local wildfire could endanger the field team, the non-essential work should be rescheduled. This Management Plan is intended to provide information needed to prepare and respond to a situation where wildfire smoke has inundated the area and the safety of outdoor activities needs to be evaluated. According to *Wildfire Smoke: A Guide For Public Health Officials* (California Air Resources Board et al. 2019), wildfire smoke is a mixture of air pollutants where particulate matter is the main concern. A large population can be exposed to smoke from a wildfire event; however, most healthy adults and children will recover quickly from wildfire smoke exposure. Certain portions of the population may be at greater risk of experiencing health effects.

“Wildfire behavior will vary depending on natural fuel type; fires in forest fuels can range from mild to severe and can spread very slowly or extremely rapidly depending on weather and fuel conditions. Wildfires in forests can last for weeks or months and are often the type that results in the most severe and longest duration air quality impacts. Smoke levels in populated areas can be difficult to predict” (California Air Resources Board et al. 2019).

### Determining Potential for Harmful Exposure

When there are wildfires and/or smoke in the area where outdoor work is to be performed, the Field Lead, or designee, will access air quality conditions at the beginning of each shift at a minimum. This will occur more frequently depending on conditions.

The current and forecasted Air Quality Index (AQI) can be found at <https://www.airnow.gov/>. The AQI is a metric that ranges from 0 to 500. The AQI value increases as the amount of particulate matter in the air increases (Air Now 2020).

Anchor QEA’s policy will be to avoid non-essential field work when the AQI is 101 or greater. The use of controls (N95 masks) during smoky conditions in order to continue with field work will not be implemented when the AQI is greater than 150. For work to continue with an AQI between 101 and 150, justification must be established as to why the work cannot be delayed until conditions improve.

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# Field Program Wildfire Management Plan

## Recommended Response Based on AQI Values

QI Category (AQI Values)	Anchor QEA Recommended Response *
<b>Good (0-50)</b>	None
<b>Moderate (51-100)</b>	For most employees, no action. Employees who are aggravated by conditions should take appropriate actions. Continue to monitor situations.
<b>Unhealthy for Sensitive Groups (101-150)</b>	For most employees, no action. Employees who are part of sensitive groups should take appropriate actions. Continue to closely monitor situations.
<b>Unhealthy (151-200)</b>	Outdoor work in these locations should be discontinued without the use of additional controls. ** Closely monitor situations.
<b>Very Unhealthy (201-300)</b>	Outdoor work in these locations should be discontinued without the use of additional controls. ** Closely monitor situations.
<b>Hazardous (&gt; 300)</b>	Outdoor work in these locations should be discontinued without the use of additional controls. ** Closely monitor situations.

**NO  
outdoor  
work or  
activities  
should  
continue**

Source: Air Now 2020

\* For any conditions where smoke and ash are present in the air, tight-fitting dust-resistant safety glasses or chemical goggles should be used as necessary to prevent or minimize eye irritation.

\*\* N95 or P100 respirators can help protect your lungs from smoke or ash (if fit tested and properly worn) (California Department of Public Health et al., not dated, *Wildfire Smoke Factsheet*).

If it is believed a respirator is needed for this purpose, work must be stopped and re-evaluated. Additionally, the Project Manager and Health and Safety should be consulted prior to proceeding.

## Evacuation Levels and Response

### LEVEL I (1)

“EVACUATION or PROTECTION ALERT: A wildfire threat is in your area. It would be wise to consider planning and/or packing, in the event an evacuation becomes necessary” (U.S. Forest Service 2020).

### LEVEL II (2)

“EVACUATION WARNING or NOTICE: High probability of a need to evacuate. You should prepare now by packing necessary items and preparing your family, pets, and vehicle for potential departure” (U.S. Forest Service 2020).

### LEVEL III (3)

“EVACUATION REQUEST or ORDER: Occupants of the affected area(s) are asked to leave within a specified time period, by pre-designated route(s). Perimeter roadblocks are typically established” (U.S. Forest Service 2020).

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## Field Program Wildfire Management Plan

When a Level I (1) is issued, work should be evaluated. Only essential necessary work should be performed with a pre-evacuation plan in place. If work is continued, conditions are to be re-evaluated at least every hour. No work is to be performed under a Level II (2) or III (3). Staff should not enter or evacuate areas designated as a Level II (2) or III (3).

### General Measures / Guidance

- Conditions should be monitored for wildfires in the area where work is to be performed.
- Wildfire discussions are to be part of the daily safety briefing when conditions are present.
- Evacuation plans should be in place prior to needing to evacuate.
- If planning to use respirators, fit testing must be accomplished prior to needing to use them.
- When unsure about conditions, pause work and evacuate, as necessary.
- Pre-evacuation plans must include a primary and alternate route in addition to items that must be taken with the team.
- Everyone has "Stop Work Authority."

### References

Air Now, 2020. AQI Basics. Accessed July 2020. Available at: <https://www.airnow.gov/aqi/aqi-basics/>.

California Department of Public Health, Department of Health & Human Services, Centers for Disease Control and Prevention, U.S. Forest Service, California Air Resources Board, Office of Environmental Health Hazard Assessment, U.S. Environmental Protection Agency. (n.d.). *Wildfire Smoke Factsheet: Protect Your Lungs from Wildfire Smoke or Ash*. EPA-452/F-18-002. Available at: [https://www3.epa.gov/airnow/smoke\\_fires/respiratory-protection-508.pdf](https://www3.epa.gov/airnow/smoke_fires/respiratory-protection-508.pdf).

California Air Resources Board, California Office of Environmental Health Hazard Assessment, U.S. Centers for Disease Control and Prevention, U.S. Forest Service, and U.S. Environmental Protection Agency, 2019. *Wildfire Smoke: A Guide for Public Health Officials*. Research Triangle Park, North Carolina: United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Health and Environmental Impacts Division. EPA-452/R-19-901. Revised August 2019. Available at: <https://www3.epa.gov/airnow/wildfire-smoke/wildfire-smoke-guide-revised-2019.pdf>.

U.S. Forest Service, 2020. *General Descriptions for the Three Evacuation Levels*. Accessed July 2020. Available at: [https://www.fs.usda.gov/Internet/FSE\\_DOCUMENTS/stelprd3852749.pdf](https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprd3852749.pdf).

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