May 20, 2025 Via email

Tanya MacIntosh
Chair
Mackenzie Valley Land and Water Board
P.O. Box 2130 4922
48th Street 7th Floor YK Centre Mall
Yellowknife, NT X1A 2P6

MV2021L2-0004 and MV2021D0005: Spill Contingency Plan Version 3.0, Prairie Creek Mine, NT

Please find attached a revised Spill Contingency Plan (Version 3.0) for the Prairie Creek Mine. This plan is submitted under the "REVISIONS" condition of water licence MV2021L2-0004 (WL) and land use permit MV2021D0005 (LUP). Canadian Zinc (CZN) has completed some administrative updates to this plan which include the following:

- Put the text for the plan into a different template;
- Contact information change;
- Current dates, WL Number(s), plan version, etc.;
- Fixes to a few spelling errors;
- Added a sentence to the end of section 2.0 to indicate the latest WL issuance date;
- Changes to the bullet point text in Section 4.0 to reflect the current status of tanks on site as well the corresponding changes to Figures 3 and 4;
- Verified, and if necessary, updated phone numbers in Section 7.2; and
- Added a hyperlink to Appendix A for the NT/NU Spill Form.

As per the conditions of the WL and LUP titled "IDENTIFY TRADITIONAL KNOWLEDGE" along with Directive(s) received from the Board on the recent approval of other management plans, CZN is identifying that no Traditional Knowledge has been received or incorporated into this revised submission of the Spill Contingency Plan. CZN also submits that since these updates are very much administrative in nature and do not change the previously approved fundamental spill

control principles within this plan that the Board does not conduct a public review on the Spill Contingency Plan Version 3.0 and instead approves the plan in its entirety as submitted[1].

Please note that in the WL Reasons for Decision (RFD) the Board required CZN to update the Spill Contingency Plan with the items as indicated (see page 124) to reflect updates as agreed to during the regulatory proceeding 90 days prior to Construction. The submission of this plan does not contain those updates because at this time, CZN remains in mineral exploration and/or care and maintenance at the Prairie Creek Mine. When CZN is ready to begin Construction activity at Prairie Creek those updates to the Spill Contingency Plan as listed in the RFD will be completed and a new version of the plan submitted 90 days prior to Construction as per Part H, Condition 2 and Schedule 7, Condition 1 of the WL.

For any questions please contact myself at lynn.boettger@norzinc.com or alternatively Claudine Lee, VP Corporate Social Responsibility, at claudine.lee@norzinc.ca.

Sincerely,

Lynn Boettger
Permitting Manager

Cc:
Dani Rogers, GNWT

[1] The most current approved version of the Spill Contingency Plan is Version 2.0 which was last approved on September 25, 2020 under previous authorizations MV2020C0008 and MC2019L2-0006.

NORZINC
A PREMIUM MINE DEVELOPER

SPILL CONTINGENCY PLAN

Prairie Creek Mine

Version 3.0

May 2025

MV2021L2-0004 and MV2021D0005

Table of Contents

List of Appendices

Revision History

The Prairie Creek Waste Management Plan was last updated May 14th, 2020.

This section includes a revision history table (below) to summarize all versions and significant revisions made to the Plan.

Table 3: Revision History Table

Revision	Description	Author	Revision Date
1	Initial version	David Harpley	2019-04-17
2	Updated	David Harpley	2020-05-14
3	Updated	NorZinc Staff	2025-05-20

List of Abbreviations

AMSL	Above Mean Sea Level
CCME	Canadian Council of Ministers of the Environment
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
CZN	Canadian Zinc Corporation
DFO	Department of Fisheries and Oceans
ECC	Environment and Climate Change, Government of the Northwest Territories (formerly Environment and Natural Resources)
ECCC	Environment and Climate Change Canada, Federal Government
ENR	Environment and Natural Resources, Government of the Northwest Territories
GNWT	Government of the Northwest Territories
HDPE	High-Density Polyethylene
L	Litre
m	metre
m3	cubic metres
M	Million
Mine	Prairie Creek Mine
MSDS	Material Safety Data Sheet (now SDS)
NNPR	Nahanni National Park Reserve
NWT	Northwest Territories
Plan	Spill Contingency (or response) Plan also called SCP
PPE	Personal Protective Equipment
SDS	Safety Data Sheet (formerly Materials Safety Data Sheet - MSDS)
ULSDF	Ultra-Low-Sulfur Diesel Fuel
WHMIS	Workplace Hazardous Materials Information System

Glossary

Flammable Liquids	Liquid products such as diesel fuel, gasoline, and other petroleum-based products that can burn.
Hazardous Materials	Materials that can cause harm to human health and the environment.
Non-hazardous Materials	Materials such as food wastes, paper, wood, plastics, glass, and scrap metals that are not harmful to human health or the environment but still need to be properly managed or in the event

	of a spill cleaned up.
Petroleum Products	Materials such as diesel fuel, gasoline, grease and other products made from oil.
Safety Data Sheets	Safety Data Sheets (SDSs) are summary documents that provide information about the hazards of a product and advice about safety precautions.

1.0 Introduction

This Spill Contingency Plan (SCP) describes the actions that will be undertaken for all types of spill incidents and conditions associated with exploration at CZN's Prairie Creek Mine (the Project), specifically the treatment of mine water, surface exploration drilling and the development of a 2nd underground Decline. This SCP is not intended for the mine operations phase. This SCP has been developed for the Project and regulatory approvals in accordance with the Guidelines for Spill Contingency Planning (INAC 2007) and the Guide to the Spill Contingency Planning and Reporting Regulations issued under the Environmental Protection Act (Environment and Natural Resources 2011).

This Spill Contingency Plan applies to exploration activities at the Prairie Creek Mine site.

1.1 Company Name, Location and Mailing Address

Company Name:
Canadian Zinc Corporation, a subsidiary of NorZinc Ltd.

Head Office:
Address: Suite 907 – 510 Burrard Street, Vancouver, BC V6B 4N9
Phone: +1.604.688.2001
Fax: +1.604.688.2043
Email: claudine.lee@norzinc.com

Prairie Creek Mine:
Site phone: 778-244-9848 *(note this number is not active if site is closed)*

1.2 Purpose and Scope

The purpose of the SCP is to provide a guide to all site staff in the event of an accidental release of fuel or other hazardous material associated with exploration. The SCP identifies key response personnel and their roles and responsibilities in the event of a spill, as well as the equipment and other resources available to respond to a spill. It details spill response strategies, tactics and procedures designed to minimize potential health and safety hazards and reduce potential environmental effects related to a spill incident. All persons involved with the Project must read and be familiar with the SCP. All staff will be expected to know the following:

- Location and content of the SCP;
- Properties and hazards associated with the chemicals being handled;
- Inventory and proper use of the spill response kit;
- Required appropriate personal protective equipment (PPE); and
- Required notification procedures to be employed in the event of an incident and details to be communicated.

1.3 NorZinc Environmental Policy

- **Comply** with and adopt the spirit of all applicable laws, regulations and standards, and where laws do not adequately protect the environment, apply standards that minimize any adverse environmental impacts resulting from its operations, products and services;
- **Communicate** openly and in a timely manner with government on environmental issues, and contribute to the development of policies, legislation and regulations that may affect NZC and its operations;
- **Recognize** local communities as stakeholders and engage with them in a process of open consultation and timely communication regarding environmental management issues and impacts, and seek to involve them in decision making and implementation;
- **Ensure** that employees and suppliers of goods and services are informed about this policy and that they are aware of their environmental responsibilities in relation to NZC's business; and
- **Develop** and implement management systems to identify, control and monitor potential environmental risks arising from operations, and be prepared to respond to adversity.

2.0 Project Setting and Description

The Prairie Creek Mine is located at 61º 33' north latitude and 124º 48' west longitude (see Figure 1). The Mine is situated adjacent to Prairie Creek about 48 km upstream from its confluence with the South Nahanni River, and 7 km upstream of the point where Prairie Creek crosses the boundary of the expanded Nahanni National Park Reserve.

The mine site is at an elevation of 850 m above sea level, and is situated in topography characterized by low mountains and narrow valleys with an average relief of 300 m. Short summers are typical of the area's sub-arctic climate, where the mean annual temperature is -5ºC. Annual precipitation is approximately 40 cm, most of which falls as rain.

The site is located adjacent to Prairie Creek, approximately 7 km upstream from an internal boundary of the Nahanni National Park Reserve (NNPR). The site is remote and surrounded by the NNPR. Local communities include Nahanni Butte some 90 km distant, located near the mouth of the South Nahanni River, of which Prairie Creek is a tributary, and further downstream is Fort Simpson, located near the confluence of the Liard and Mackenzie Rivers.

Between 1970 and 1980, extensive underground development of the Prairie Creek Mine took place. The existing mine infrastructure was built in 1981-82 (see Figure 2). The main site consists of a mill, fuel tank farm, warehouses and shops, administration building and accommodation units. The site was placed into receivership in 1982 and has been held on care and maintenance since. CZN has undertaken various exploration programs from the early 1990's, and continues to manage the site.

Water Licence MV2001L2-0003 was issued in September 2003 which allowed CZN to develop a new underground Decline and perform diamond drilling. A new Decline was developed from June 2006 to October 2007. Drilling from the Decline occurred from November 2006 to December 2007. The Water

Licence was renewed in 2008 for 5 years for the purpose of continuing these activities. The Licence was amended on May 10, 2012 to allow CZN to develop a second Decline. The term of the Licence was also extended to September 9, 2019. CZN has yet to develop the second Decline, but at the end of 2014, CZN rehabilitated the 880 level drive and first decline in preparation for dewatering of the first Decline and continued underground exploration drilling.

Dewatering commenced in December, 2014, and drilling occurred from February-July, 2015. Thereafter, the Decline was allowed to re-flood.

The current water licence is MV2021L2-0004 and was issued to CZN in September 2023. Along with Land Use Permit MV2021D0005, this water licence is an amalgamation of previous licences and allows CZN to undertake "…surface and underground mineral exploration, mining and milling, and Closure and Reclamation at the Prairie Creek Mine."

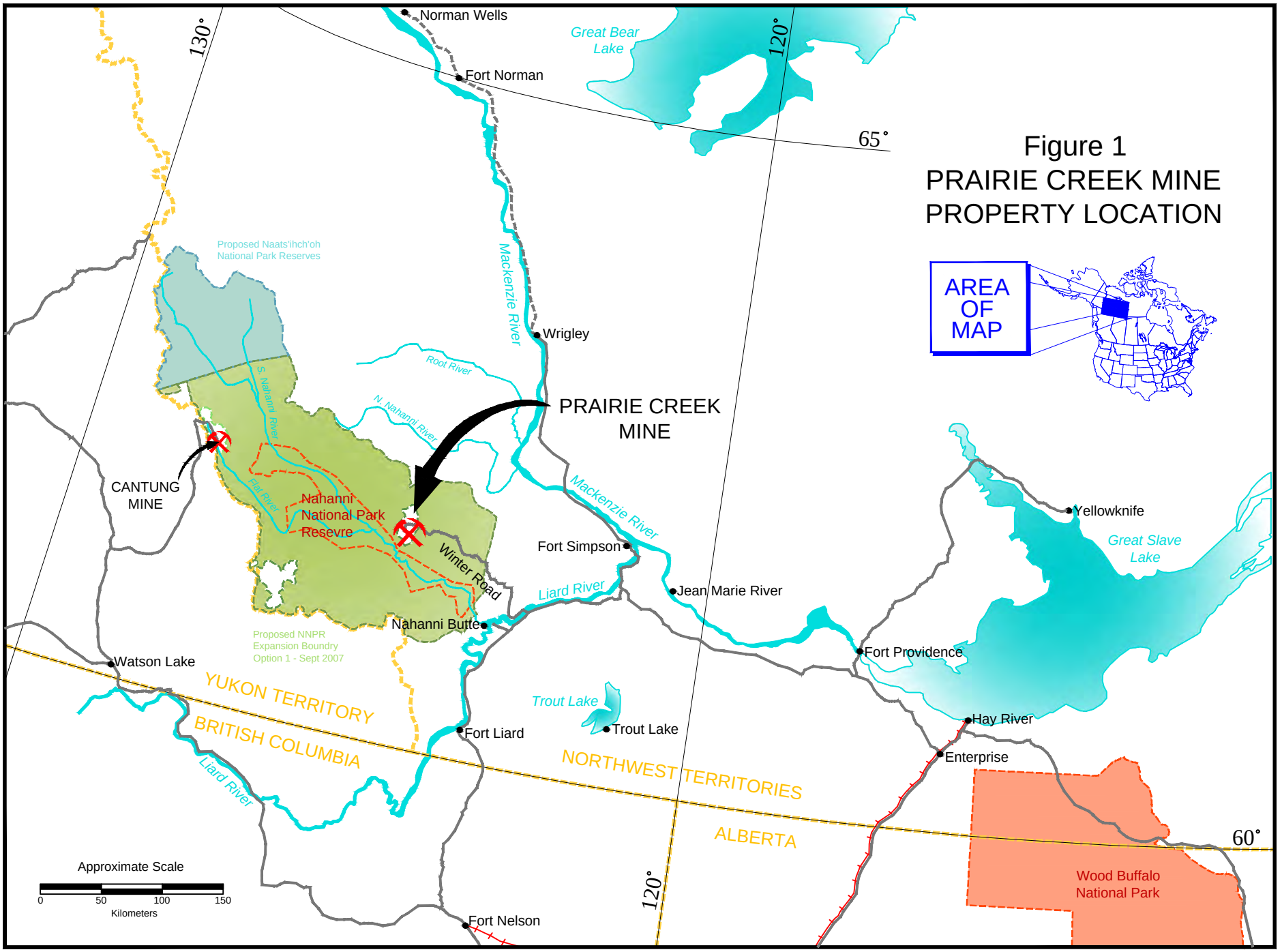
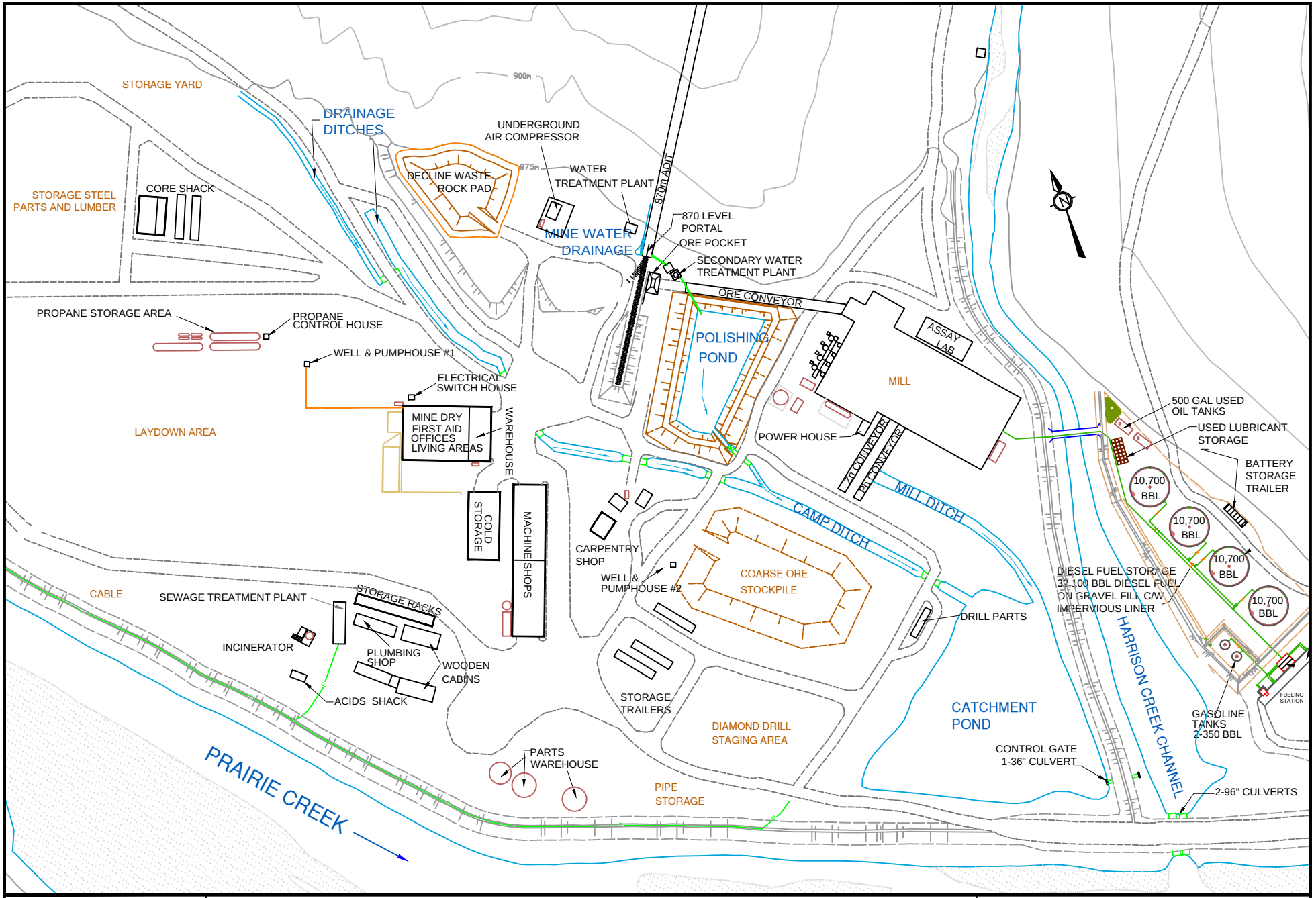


Figure 1
PRAIRIE CREEK MINE
PROPERTY LOCATION
AREA OF MAP
PRAIRIE CREEK MINE
CANTUNG MINE
Norman Wells
Fort Norman
Great Bear Lake
Wrigley
Mackenzie River
Root River
N. Nahanni River
S. Nahanni River
Flat River
Nahanni National Park Resevre
Proposed Naats'ihch'oh National Park Reserves
Proposed NNPR Expansion Boundry Option 1 - Sept 2007
Winter Road
Nahanni Butte
Fort Simpson
Liard River
Jean Marie River
Yellowknife
Great Slave Lake
Fort Providence
Hay River
Enterprise
Watson Lake
YUKON TERRITORY
BRITISH COLUMBIA
Liard River
Trout Lake
Trout Lake
Fort Liard
NORTHWEST TERRITORIES
ALBERTA
Wood Buffalo National Park
Fort Nelson
Approximate Scale
0 50 100 150
Kilometers
130°
120°
65°
60°
120°



Note: This is for illustration purposes only. During care and maintenance site is being cleaned up and organized. Locations of some features subject to change.

Scale:	**As Shown**
Date:	May 2025

PRAIRIE CREEK MINE

FIGURE 2: INFRASTRUCTURE AT PRAIRIE CREEK MINE

3.0 Spill Reporting

A spill is defined as a release of a substance that is likely to be an imminent environmental or human health hazard. All immediately reportable spills and minor spills are to be documented including approximate quantity, product type, location, whether the spill in still in progress, odour, colour, and weather), along with cleanup responses and any outstanding concerns. This information may be required to be reported to a land-use or water licence inspector and/or included in an annual report to be submitted to fulfil requirements of a land use permit or water licence.

The CZN Incident Commander must be notified immediately about the occurrence of any spill. An immediately "reportable" spill is defined as a release of a substance that is likely to be an imminent environmental or human health hazard or meets or exceeds the volumes outlined in Appendix B.

A spill that meets these criteria must be reported to the NWT 24-hour Spill Report Line at **867-920-8130** and the NT-NU Spill Form provided in Appendix A will be completed and emailed to spills@gov.nt.ca. The Incident Commander will subsequently be responsible for:

- Determining if the spill is reportable as outlined in **Appendix B**.
- Reporting the spill incident to the NT-NU 24-Hour Spill Report Line (**867-920-8130**).
- Completing the NT-NU Spill Report Form (**Appendix A)**.
- Notifying CZN management.

To Report a Spill:

Fill out the NT-NU Spill Report Form (also in Appendix A) as completely as possible before calling in the spill report.

Contact the **24-HOUR EMERGENCY SPILL REPORT LINE: 867-920-8130**

Where fax is available, fax the completed NT-NU Spill Report Form to 867-873-6924. Alternatively, if email is available, email the completed NT-NU Spill Report Form to **spills@gov.nt.ca**.

The Incident Commander will also ensure that all other spill reporting (i.e., Monthly Spill Report) is completed and submitted to the applicable inspector. Spills of flammable liquids, such as diesel and gasoline, are reportable if the spilled quantity exceeds 100 L. Spills of waste oil, vehicle fluids and wastewater are reportable if the spilled quantity exceeds 100 L or 100 kg. Spills are also reportable if they are near or into a water body, irrespective of quantity. For more details, consult the reportable quantities presented in Appendix B.

The spill report will be completed in accordance with the Guide to the Spill Contingency Planning and Reporting Regulations issued under the Environmental Protection Act (Environment and Natural Resources 2011), and contain the following information:

- Date and time of spill
- Location of spill

- Direction spill is moving
- Name and phone number of a contact person close to the location of the spill
- Type of product spilled and quantity
- Cause of spill 7
- Whether spill is continuing or has stopped
- Description of product spilled
- Action taken to contain, recover, clean up, and dispose of spilled product
- Name, address and phone number of person reporting the spill
- Name of person in charge of the management and control of the spill incident at the time of the spill.

Spills occurring in and around waterbodies will be communicated to First Nations, including ADKFN, in a timely manner.

4.0 Potential Hazardous Materials

During site exploration, a number of hazardous materials may be used or generated that could potentially be contaminants if released to the environment, including:

- Fuels: gasoline and diesel
- Lubricating oils and grease
- Hydraulic and motor oil
- Antifreeze and other coolants
- Hydrocarbon-contaminated soil, snow/ice and/or water
- Water treatment reagents
- Explosives and explosive residues.

Safety Data Sheets (SDS) are included in Appendix C. Perhaps the highest spill risk is associated with fuel storage. The main fuel source locations at the Mine, and control points, are as follows (see Figure 3 for locations):

- The Tank Farm consists of four 10,000 barrel capacity tanks for diesel (presently only one tank contains a small proportion of diesel), two 350 barrel capacity tanks for gasoline (empty and not suitable for use), and waste oil stored in one 5,000 gallon (20,000 litre) tanks. The control point for spills in the Farm is the containment berm for the tanks. Beyond this, the secondary control point is the culverts where Harrison Creek discharges to Prairie Creek. Any spills to the south-east of the farm would be contained by the toe of the Prairie Creek containment berm;

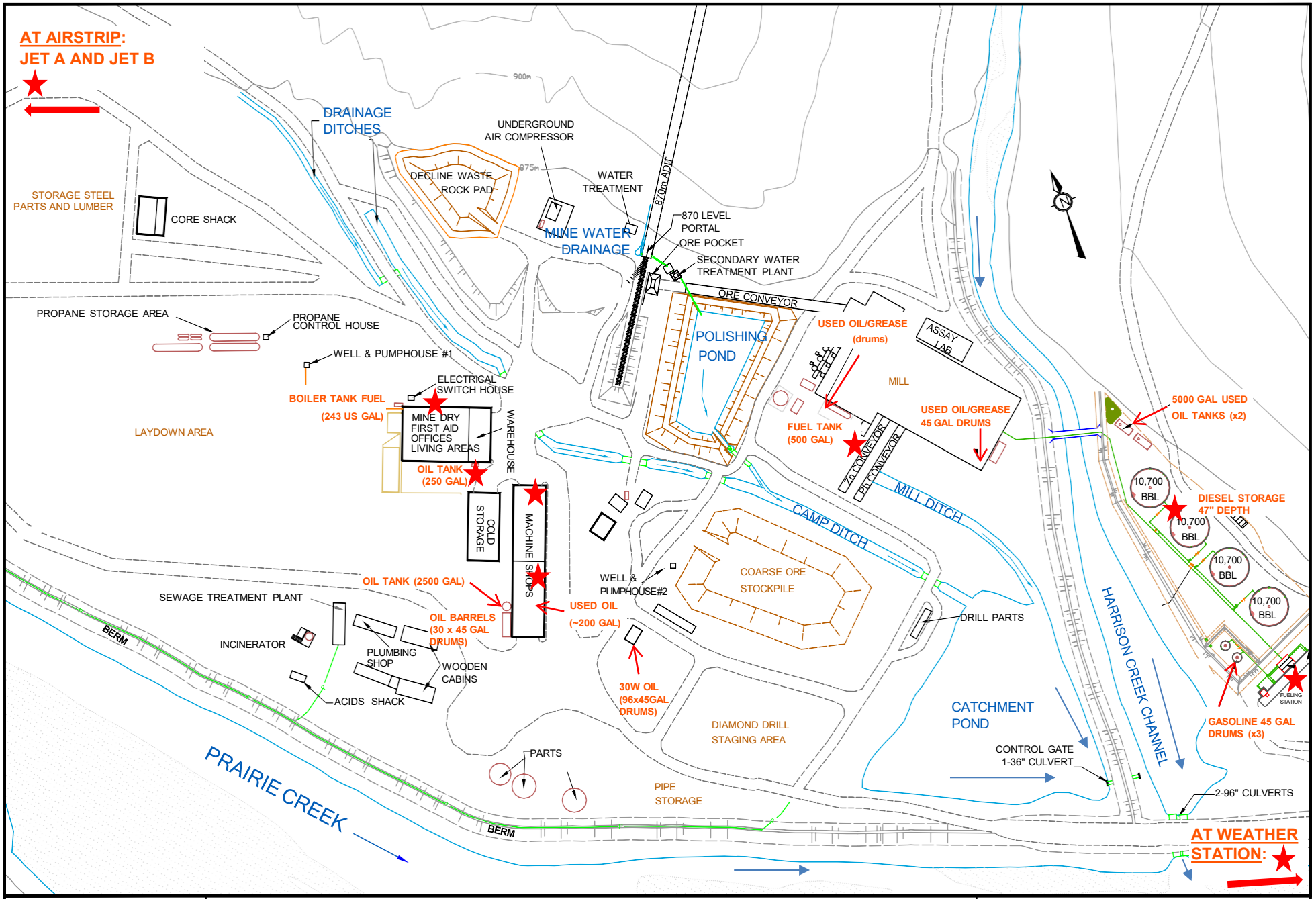
- The two camp power generators are fed by a 500 gallon diesel tank mounted on a steel cradle inside a lined and bermed containment. The secondary control point for a spill is the main site drainage channel which flows into the Catchment Pond (the outlet of the Catchment Pond is also a control point with a gate weir);
- A 5000 gallon tank on the south-west corner of the rear Machine Shop stores lubricating oil for use in vehicles. The tank is fully contained in a cement berm. The secondary control point for a spill is the main site drainage channel;
- A 920 Litre tank (with two layers of containment and inside a building) on the north-west corner of the Administration Building (which currently houses the kitchen, First Aid, Mine Dry and accommodations), and a 200 gallon tank on the south-east corner provide diesel for heaters providing heat (inside lined and bermed containment). The secondary control point for a spill is the main site drainage channel;
- A limited number of 45 gallon (200 litre) drums containing aviation gas or Jet B are stored at the airstrip. The drums are located on a clay liner which slopes away from Prairie Creek to a narrow drainage collection channel. The control point for a spill beyond the containment is at the downstream end of the channel before an access road leaves the airstrip.

In addition, an extension of the site to the south, called the South Yard, contains other facilities, including a Reagent Storage Pad upon which hazardous materials are stored. This includes a limited number of drums of hydrocarbon-stained soils. Figure 4 shows the South Yard facilities.

Environmentally sensitive areas are considered to be Prairie Creek adjacent to the site and Harrison Creek that bisects the site. Prairie Creek is known to host bull trout (Salvelinus confluentus) and mountain whitefish (Prosopium williamsoni), both of which are suspected to spawn upstream. Bull trout are listed as Special Concern by COSEWIC (2011, 2012). The Mine site is within Northern Mountain Woodland Caribou (Rangifer tarandus caribou) range, which are listed as Special Concern under SARA (2005), but assessed as Secure under the NWT General Status Rank. Grizzly Bear (Ursus arctos) are also common to the area, and are assessed as Special Concern by COSEWIC (2012) and ranked as Sensitive in the NWT.

Prairie Creek is protected from spills by the perimeter dyke around the site. Where Harrison Creek flows through the site, it has been channelized and the banks include protection dikes. Discharge from the main site is only via the controlled Catchment Pond outlet.

An inventory of all chemicals on site can be found in Appendix D, which lists the locations, quantities and container types. MSDS for these chemicals can also be found in Appendix C.



Note: This is for illustration purposes only. During care and maintenance site is being cleaned up and organized. Locations of some features subject to change.

Scale:	As Shown
Date:	May 2025

SCALE

0 25 50 75 100

METRES

★ Spill Kit Location

PRAIRIE CREEK MINE

FIGURE 3: CURRENT HYDROCARBON & CHEMICAL STORAGE LOCATIONS

404600 404700 404800 404900 405000 405100 405200 405300 405400 405500

6825400 6825300 6825200 6825100 6825000 6824900 6824800

Prairie Creek

N W E S

SYMBOL LEGEND

- Infrastructure
- Roads
- Water
- 50m contours

Figure 4: Spill Kit and Hydrocarbon Locations in South Yard

Datum: NAD 1983 UTM Zone 10N
Drawing: South Yard 1-2

Spill kit location

5.0 Response Organization

5.1 Spill Classification System

A spill classification system widely used in industry will also be adopted, as follows:

Level 1 A **minor** event that is confined to the immediate mine site and can be handled by CZN/available contractor personnel using the response resources, manpower and equipment at hand.

Level 2 A **moderate** event where an incident has spread beyond the mine site, or where employee safety is at risk or where external resources (i.e., emergency services, or contractors/external resources are required. Public safety however is not threatened.

Level 3 A **major** event where public safety or property is endangered, or major off-site environmental impacts have occurred or could occur, and external resources are required.

5.2 Response Team

The initial CZN incident response team (comprised of mine site personnel) will typically consist of five personnel: one Incident Commander (the Camp Manager), one Safety Officer or Medic, and three responders, one of which may be a mechanic. The Incident Commander will be responsible for all communications off the spill site and will direct and document the operations undertaken in a chronological log. Communications will be relayed via the Incident Commander to CZN Head Office for required external notification to regulators and communication with local stakeholders.

The Safety Officer's/Medic's primary responsibility will be to assess hazardous and unsafe situations and develop measures for assuring personnel safety. The person may also assist with response operations in the early stages of an incident or assist from time to time if required, but safety remains the priority.

As mechanical equipment such as pumps and skimmers could be involved, a mechanic with appropriate tools is included as part of the response team. The team would be supported by others delivering additional equipment, as necessary.

In the event that the spill incident requires additional external resources, including specific technical expertise, addition equipment, etc. the Incident Commander will be responsible for obtaining these resources in a timely manner from the off-site resources listed in Section 5.2 of this SCP.

6.0 Action Plan

6.1 Spill Prevention

The preferred manner to deal with spills is first by avoidance through appropriate storage, handling, and transportation measures. The prevention of spills is achieved through actions such as:

Containment and Storage:

- All potentially hazardous materials will be stored at a designated storage area more than 30 m from the highwater mark of any waterbody.
- All fuel storage vessels will have secondary containment such as containment trays, berms, and/or double walled tanks designed to hold 110% of total volume of stored fuel,
- All fuel storage tanks, including secondary containment and gas cans will be inspected daily during operations.
- All sewage and solid waste will be contained and sealed in watertight containers.
- Spill mats and/or drip pans/ trays will be placed under all mobile fueling containers and under equipment when not in use, defined as idling or parked for greater than two hours.

Design:

- All stationary activities (i.e., camp activities) will be conducted at least 30 m from the ordinary high-water mark of any waterbody or watercourse.
- Tanks used for transporting any greywater will be watertight and designed to reduce surge during transport

Spill kits are maintained on site at the main fuel farm facility, mechanic shop, gasoline station, fuel truck and at each surface diamond drill when such a drill is operating

Inspection, Maintenance and Monitoring:

- All equipment used for operations will be in good working order and free of leaks.
- Regular inspection and maintenance will be conducted for all heavy equipment and vehicles, including fuel transfer hoses and fuel/oil lines, associated with the Project.
- Identified equipment or vehicle deficiencies will be repaired.
- Tanks used for transporting greywater will be regularly and properly inspected and maintained by the operator.
- Drips that make contact with the ground will be cleaned up immediately.
- All vehicles and camp units will be equipped with fire extinguishers.

Training:

- As part of the comprehensive Health, Safety and Environmental orientation and training effort, all personnel workers will receive SCP training prior to beginning work.

6.2 Initial Actions

Before responding to any spill, it is important to first STOP and THINK:

- Identify Hazards
- Assess Risks
- Control Risks

There are three basic priorities when responding to a spill:

- Respond Quickly
- Respond Safely
- Full Notification and Reporting

The following initial actions should be taken by the first person(s) who identifies a spill:

1. Be alert, ensure your safety and the safety of others first.

2. For a hydrocarbon spill, isolate, remove or extinguish all ignition sources.

3. Identify the spilled material (refer to MSDS's if necessary) and assess the hazard to persons and the environment in the vicinity of the spill or leak, identify escape routes.

4. Report the spill, leak or system failure without delay to the Camp Manager, who will in turn notify the Spill Response Team.

5. Before undertaking a response action proximal to the spill, ensure personnel have and wear the appropriate personal protective equipment (PPE).

6. Block spill drainage paths and, if possible, implement spill response measures at the site and appropriate Control Points. Priority should be given to preventing the spill from entering a water body.

7. If possible, without further assistance, control any danger to people and the environment.

8. Assess whether the spill, leak or system failure can be readily stopped or brought under control.

9. When safe to do so, stop the leak and/or flow of the spilled material. For an acid spill, ensure the proper PPE are worn and avoid the potential for direct or indirect contact.

10. Gather information on the event and the status of the situation, including the nature, extent and approximate amount of the spill and, if spill is into a waterbody, estimate speed of water flow.

11. Resume any safe, effective action to contain, clean up, or stop the flow of the spilled product. Await the arrival of the Spill Response Team.

6.3 Spill Response Actions

6.3.1 General

The potential exists for spills of both petroleum products and/or various chemicals. A spill may be in the form of a liquid as in petroleum products, or in the form of a solid. A dry chemical spill may transform into a liquid chemical spill if it is allowed to gain access to a water body (lake or stream) prior to being contained and successfully cleaned up.

Spills may occur on land, snow, ice or in the water or to a combination of one or more depending on the conditions at the time of spill. Various proven practical methods of containment and recovery are well documented for use in northern climates and are summarized in the following documentation.

The first initial action is to prevent any direct health risk to responding personnel. Persons not directly associated with the clean-up operations are to be directed to leave the immediate area. The area should be isolated and limited to traffic as directed by the response team personnel.

The ability to contain and recover spilled materials is influenced by the spill location, the size and rate of release, transport and terrain conditions. This information needs to be matched against the time needed to deploy response personnel and equipment. The following response elements need to be considered:

- Equipment and support material mobilization time
- Personnel mobilization, transmit and assembly at spill site
- Actual equipment set-up and deployment time.

6.3.2 Containment

The type and size of the containment method chosen will depend on the following factors:

- **Size of spill** - Berms surrounding large spills that cover extensive areas are difficult and time consuming to build. Earth and snow berms may be more easily put into place than sand bag containment. It is also important to build the berm as close to the source as possible to minimize any spreading.
- **Terrain** - Steep or varied terrain can make an effective response difficult, particularly with heavy equipment. Spills will travel faster on steep inclines and require faster response times. Larger, flat areas will require longer berms to contain a spill; however, spills travel much slower allowing additional time frames for the construction of barriers.
- **Soil types** - Loose, coarse or dry soils will allow liquid spills to be absorbed and require additional work to remove contaminated materials. Frozen soils create a natural barrier that aid in clean up. Trenches or berms can be difficult to construct without the use of heavy machinery.
- **Proximity to water** - It is important that every precaution be taken to ensure that spills do not enter a waterway. If there is any possibility of contamination, a stream or river should be protected by diversion of the spill from the watercourse.

- **Weather** - Weather can play an important role in spill response operation, particularly if the ground is frozen (or beginning to thaw). The presence of water (either from rainfall or spring melt) can increase the clean-up requirements. Water will also increase the tendency for the spill to spread and pose a hindrance to the effective clean up. Soluble chemicals are also a concern when water is present as contamination can spread rapidly.
- **Location** - the location that the spill occurs will greatly influence the type of containment measures and the ability to successfully clean up the spill.
- **Daylight** - during the winter daylight is at a minimum. This greatly reduces the ability to assess the spill and provide an adequate response. Insufficient light requires that additional sources be available to affect the cleanup.
- **Temperature** - Air temperatures of the north, with the extremes during the winter, demand attention by response personnel to ensure the safety of the response team. Although the extreme cold can be beneficial to the containment of a spill on land, it can also be detrimental in the efficiency and response time to control and contain the spill.

Table 4-1 summarizes the Spill Response Actions for hydrocarbon spill incidents on Land, on Snow/Ice and on Water.

Table 4-1: Summary of Spill Response Actions

General Actions	• Stop source if safe to do so • No Smoking - eliminate ignition sources • Block entry of spills to waterways by building berm or trench • Ground electrical containers when transferring fuel • Avoid contact with solvents or other chemicals • Plan and request additional cleanup assistance, if required.
On Land	• No Smoking - eliminate ignition sources • Block entry into waterways by building a berm or trench • Contain with earth berm or other barrier • Capture minor spills with appropriate sorbent pads • Recover large spills with pumps or vacuum equipment
On Snow/Ice	• No Smoking - eliminate ignition sources • Block entry into waterways and contain with snow berm or other barrier • Trench or ditch to intercept or contain fuel on snow, where feasible • Compact the snow around the outside perimeter of the spill area • Construct a berm with snow, either manually or with shovels or heavy equipment such as Bobcats and Front-end Loaders as available

	• Contain or collect contaminated snow • Use synthetic liners to contain on site if feasible • Recover minor spills with appropriate sorbent pads or snow
On Water	• Contain spill as close to release point as possible • Use spill containment boom to concentrate slicks for recovery • Use protection (diversionary) booming using sorbent booms to deflect slicks from nearby sensitive areas • On small spills, recover using appropriate sorbent pads • Do not use sorbent booms/pads in fast currents and turbulent water • Intercept moving slicks in quiet areas using sorbent booms

6.3.3 Spills on Land

- Once a spill is identified, all sources of ignition should be turned off (e.g., no smoking, shut off engines).
- Identify the product involved, the source of the leak or spill, and if safe to do so and If readily possible, stop the leak or spill.
- Contain the spill to ensure the potential for the spilled material reaching a body of water is minimized;
- Secure the affected area, ensuring the area is safe for entry and does not represent a threat to human health and safety of the spill responders. Public access of the area should be restricted.
- Deploy spill kits as appropriate and consider a berm or dyke around the spill to contain the liquid product; block drainage paths down-gradient.
- Leaks from a tank may be stopped by utilizing patching kits.
- Spills (on gravel, rock, soil, vegetation) may be contained by building a soil berm down slope of the running or seeping product. Plastic tarps can be placed over the berm and at the foot of it, to permit the spilled product to pool on the tarp for easy capture. Absorbent pads can be used for this purpose, and the pads can be squeezed into empty drums and re-used. Larger pools can be pumped back into drums, empty storage tanks, or “TIDY” tanks.
- It is especially important to prevent the liquid product from entering a body of water as potential environmental impacts may be greater. Even if a spill is contained, it is important to collect free product as soon as possible because seepage into a permeable ground surface can occur.
- Stains on rock may be soaked up with absorbent sheeting. The sheeting should be placed in drums for disposal in an approved manner.
- Contaminated soil and vegetation may have to be removed and disposed of in an environmentally acceptable manner.

6.3.4 Spills on Snow

The presence of snow can assist in containing spilled liquid and functions as a natural absorbent to facilitate containment and recovery.

- Containment on snow is readily achieved and is very effective due to its absorbent qualities. Some liquid spills will become immobile within snow and are easily recovered for transport or disposal.
- Snow can be used in construction of berms. Whenever possible, snow should be left in place to avoid contaminating the underlying substrate berm and lined with plastic sheeting.
- A snow berm can be strengthened by spraying it with a fine water mist that forms an ice layer on top of the snow.
- The snow-liquid mixture can be scraped up and stored in a lined area or in drums for subsequent disposal.

6.3.5 Spills on Ice

For spills that occur on ice, from either direct spillage or migration, containment is greatly affected by the strength of the ice. If the spill does not penetrate the ice, and the ice is safe to work on, then the methods of containment are similar to those employed for a spill on land. Where the spill has penetrated the ice, the situation should be handled similar to that on open water.

- Once a spill is identified, all sources of ignition should be turned off (e.g. no smoking, shut off engines).
- Where a spill occurs on ice, snow should be compacted around the edge of the spill to serve as a berm (and lined with plastic sheeting). The ice will limit seepage of fuel into the water, but the contaminated snow/ice must be immediately scraped up.
- For spills on thin ice, in situ burning should be considered but requires regulatory approval (contact the 24- Hour NWT/Nunavut Spill Reporting Line).
- Remaining contaminated snow can be placed in drums or in a lined berm (on land) for subsequent approved disposal.

6.3.6 Spills Into Water

It is important to immediately control the release of liquid product spilled into water and to contain it to the immediate spill area if possible. Assuming that product has entered water, actions to be taken can include:

- Deploy boom (s) to contain the spill area or to deflect the liquid product into a backwater area if available for containment/recovery of product. The effectiveness of this action can be limited by winds, currents (in the case of moving water) and other factors.
- Apply absorbent pads and similar materials to capture small product spills on water.

- Absorbent booms can be drawn in slowly to encircle spilled product and absorb it. Absorbent booms are often utilized as a secondary barrier to recover any hydrocarbons that escape containment booms.
- Contaminated material must be subsequently placed in drums or portable tanks for subsequent approved disposal.
- In the event of a larger spill on water, immediately seek the assistance of the response team.
- A skimmer may be deployed once a boom has been secured to capture the spilled product. The skimmer utilizes a mechanism to draw and recover hydrocarbons It is then pumped through hoses to empty fuel drums or other temporary liquid storage devices.

Spill response personnel will be trained and prepared for open water response situations. The personnel will be prepared and equipped for rapid response given that open water conditions may potentially mean that a spilled liquid product could migrate more quickly than in frozen conditions.

6.4 Spill Delineation and Monitoring

In the event of a large spill or a spill where not all the spilled liquid product can be readily cleaned up with materials on hand (as described above), delineation of the affected area may be required. This could include subsurface investigation of the area (i.e., digging of test pits, soil sampling, installation of monitoring wells) to determine the horizontal and vertical extent of the spill in the soil and groundwater.

For spill-related field monitoring programs that may need to be implemented, samples collected for chemistry and benthic community assemblage assessment would include at least one upstream sample (for reference purposes) and multiple downstream samples. All other endpoints would normally include an upstream and downstream sample only.

The results of such monitoring would assist in the development of an appropriate remediation plan for the affected area. In these cases, qualified environmental consultants would be retained to provide advice on how to proceed with delineation monitoring and remediation of the spill.

6.5 Disposal of Waste from Response Activities

Used absorbent materials from hydrocarbon spill response actions will be incinerated in the Mine incinerator. Plastics are not incinerated and will be taken off-site for approved disposal.

Soil contaminated with hydrocarbons will be temporarily stored in steel drums. The contaminated material may then be transferred to a lined-cell for bioremediation. The material may be relatively heterogeneous and may include gravel and rock. This material would not be included in samples to verify completion of remediation and would remain on site and be incorporated into a Waste Rock Pile.

Soil contaminated with metals would be stored and could potentially be subsequently processed through the Mill, provided the soil does not contain any material that could interfere with the Mill process. Representative samples would be tested to verify the appropriate remedial approach. Target treatment

concentrations would be the CCME Soil Quality Guidelines for the Protection of Environmental and Human Health, Residential/Parkland.

Any water contaminated with hydrocarbons will be stored on-site.

Water contaminated with metals can be treated in the Mine Water Treatment Plant.

6.6 Restoration of Affected Areas

Following initial spill response and containment, the approach to final cleanup and restoration of the affected area will be discussed and a plan developed in consultation with the applicable inspector prior to implementation.

Where necessary, site-specific studies may be undertaken to ensure appropriate cleanup objectives are met and a site-specific approach for soil replacement and revegetation is implemented.

7.0 Resource Inventory

7.1 On-Site Resources

Items typically contained in a spill kit are listed in Table 7-1.

Table 7-1: Items Contained in a Spill Kit

1-48” x 48” x 1/16” Neoprene Pad (Drain Stop)
Plug N Dike Granular, 1-gal U.S. (3.8 litres)
Splash Protection Goggles
2-PVC Oil Resistant Gloves
1 Pkg. Polyethylene Disposable Bags (5 mil), 10 per Package
1 Shovel (Spark Proof)
1 Case T-12 3”x12’ Mini Boom, 4 Booms/Case
Absorbants: 1 Bale 11P 256 17” x 19” x 1/2” Pads, 100 Pads / Bail

Equipment such as backhoes, dozers, crane trucks, dump trucks, vacuum trucks etc. would also be available as needed.

7.2 Off-Site Resources

CZN will endeavour to contract a bulk fuel service company located in the region, preferably close to the haul route, which has an established mobile spill response unit that would be available 24 hours a day. The company would assist CZN in its response to any large bulk fuel spill. This service company may also provide training on spill containment and cleanup to CZN employees and contractors, but this and all other items would be defined in the contract.

Additional resources and assistance will be drawn from the following sources:

Esso Bulk Fuels Agency (Fort Simpson)	867-695-2110
Environmental Protection Section, Environment Division, GNWT	867-695-7450
CIRNAC (Fort Simpson) Resource Management Officer	867-695-2626
RCMP (Yellowknife)	867-765-3900
RCMP (Fort Simpson)	867-695-1111
Fire Dept. (Fort Simpson)	867-695-2222
Fire Dept. (Fort Liard)	867-770-2222
Ambulance (Fort Nelson)	250-774-2344
Hospital (Fort Nelson)	250-774-8100
Hospital (Fort Simpson Health Centre)	867-695-7000
Hospital (Fort Simpson after hours)	867-695-3232
Fixed Wing (VILLERS Fort Nelson)	250-774-2072
Adventure Aviation (Fort St. John)	250-261-3618
Fixed Wing (WOLVERINE Fort Simpson)	867-695-2263
Helicopters (CANADIAN, Fort St. John)	250-787-0431
(GREAT SLAVE HELI, Yellowknife)	867-873-2081

For large or more complicated spills, Esso Bulk Fuels can be contacted – they have a spill response team available for deployment. This could be facilitated by aircraft.

8.0 Training and Exercises

8.1 Training

All members of the Spill Response Team will be trained and familiarized with the spill response resources, including their location and access, this SCP and appropriate spill response methodologies and reporting.

Training for Spill Response Team members will be up to and including large Level 3 events. Fuel handling crews will be trained in the safe operation of these facilities, spill prevention techniques and initial spill response actions.

A typical training session will include review of the components of the SCP including:

- Action plan
- Initial actions and spill reporting procedures
- Individuals' roles and responsibilities regarding spill prevention, detection, response and clean-up
- Location(s) of hard copies of the SCP, maps and spill kits
- Equipment available for spill response
- Content of spill kits and response trailers
- Spill response and clean-up strategies and techniques.

8.2 Spill Response Exercises

Response training will include spill response exercises where attendees will take appropriate actions and deploy suitable equipment and materials to combat a specifically designed, realistic, spill scenario. The simulated spill will involve a test medium which poses no environmental hazard but behaves like those requiring a response if spilled.

Spill exercises will be undertaken in summer (initial training) and winter (final training) conditions, and at locations representing the range of environmental conditions that exist. Popcorn, puffed wheat or a heavier inert substance will be used to simulate the "spill".

The training sessions and exercises will be held prior to the start of each season or operations year as part of a Worker Orientation Seminar. This will ensure all returning individuals receive a refresher while any new individuals become familiar with on-site spill prevention and response measures.

CZN will retain records of all individuals who attend the training session and exercises, as well as copies of their training certificates (e.g., first aid, WHIMS).

8.3 Adaptive Management

Adaptive Management is a systematic, rigorous approach designed to link environmental monitoring to management actions. The results and lessons learned from spill incidents that may occur and response/cleanup efforts undertaken will be applied to all spill incident and response efforts through the life of the Project.

APPENDIX A

NT-NU SPILL REPORT FORM

Open Spill Report Form

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
Tel: (867) 920-8130
Email: spills@gov.nt.ca

A	Report Date: MM DD YY	Report Time:	☐ Original Spill Report **OR** ☐ Update # _____ to the Original Spill Report	**Report Number:**
B	Occurrence Date: MM DD YY	Occurrence Time:		
C	Land Use Permit Number (if applicable):		Water Licence Number (if applicable):	
D	Geographic Place Name or Distance and Direction from the Named Location:		Region: ☐ NT ☐ Nunavut ☐ Trans-boundary or Ocean	
E	Latitude: _____ Degrees _____ Minutes _____ Seconds		Longitude: _____ Degrees _____ Minutes _____ Seconds	
F	Responsible Party or Vessel Name:	Responsible Party Address or Office Location:		
G	Any Contractor Involved:	Contractor Address or Office Location:		
H	Product Spilled: ☐ Potential Spill	Quantity in Litres, Kilograms or Cubic Metres:	U.N. Number:	
I	Spill Source:	Spill Cause:	Area of Contamination in Square Metres:	
J	Factors Affecting Spill or Recovery:	Describe Any Assistance Required:	Hazards to Persons, Property or Environment:	
K	Summary of the spill incident and efforts / description of the incident:			

L	Reported to Spill Line by:	Position:	Employer:	Location Calling From:	Telephone:
M	Any Alternate Contact:	Position:	Employer:	Alternate Contact Location:	Alternate Telephone:

REPORT LINE USE ONLY

N	Received at Spill Line by:	Position:	Employer:	Location Called:	Report Line Number:

Lead Agency: ☐ ECCC ☐ CCG/TCMSS ☐ GNWT ☐ GN ☐ ILA ☐ CIRNAC ☐ CER ☐ Other: _____

File Status: ☐ Open ☐ Closed

Agency:	**Contact Name:**	**Contact Time:**	**Remarks:**
Lead Agency:			
First Support Agency:			
Second Support Agency:			
Third Support Agency:			

APPENDIX B

IMMEDIATE REPORTABLE SPILL QUANTITIES

TDG Class	Substance for NWT 24 Hour Spill Line	Immediately Reportable Quantities
1 2.3 2.4 6.2 7 None	Explosives Compressed gas (toxic) Compressed gas (corrosive) Infectious substances Radioactive Unknown substance	Any amount
2.1 2.2	Compressed gas (flammable) Compressed gas (non-corrosive, non-flammable)	Any amount of gas from containers with a capacity greater than 100 L
3.1 3.2 3.3	Flammable liquids	> 100 L
4.1 4.2 4.3	Flammable solids Spontaneously combustible solids Water reactant	> 25 kg
5.1 9.1	Oxidizing substances Miscellaneous products or substances excluding PCB mixtures	> 50 L or 50 kg
5.2 9.2	Organic peroxides Environmentally hazardous	> 1 L or 1 kg
6.1 8 9.3	Poisonous substances Corrosive substances Dangerous wastes	> 5 L or 5 kg
9.1	PCB mixtures of 5 or more ppm	> 0.5 L or 0.5 kg
None	Other contaminants (e.g. crude oil, drilling fluid, produced water, waste or spent chemicals, used or waste oil, vehicle fluids, waste water, etc.)	> 100 L or 100 kg
None	Sour natural gas (i.e. contains H2S) Sweet natural gas	Uncontrolled release or sustained flow of 10 minutes or more

In addition, all releases of harmful substances, regardless of quantity, are to be reported to the NWT spill line if the release is near or into a water body, is near or into a designated sensitive environment or sensitive wildlife habitat, poses imminent threat to human health or safety, poses imminent threat to a listed species at risk or its critical habitat, or is uncontrollable.

APPENDIX C

SAFETY DATA SHEETS

FUELS, GLYCOL, DEGREASER

MATERIAL SAFETY DATA SHEET

Product Name: Arctic Diesel Fuel (3090)

SECTION 1 – PRODUCT IDENTIFICATION AND USE

Product name	Arctic Diesel Fuel	**PIN #, UN #**	1202
Chemical name	None	**TDG, DOT class**	Class 3
Common names and	Diesel fuel No. 1, Fuel oil #1-D	**Packing group**	III
Product use	Fuel	**Shipping name**	Diesel Fuel

WHMIS classification: Combustible liquid Class B Division 3; Toxic material Class D Division 2 Subdivision B

Hazard codes

NFPA	Health	2	**HMIS**	Health	2
	Flammability	2		Flammability	2
	Reactivity	0		Reactivity	0

NFPA & HMIS Ratings:0=Insignificant/No Hazard. 1=Slight Hazard. 2=Moderate Hazard. 3=High/Serious Hazard. 4=Extreme/Severe

Supplier: Irving Oil Limited, Refining Division, Box 1260, Saint John, New Brunswick Canada E2L 4H6

Phone (506) 202-2000
Emergency 1-800-424-9300
Refinery (506) 202-3000

SECTION 2 – HAZARDOUS INGREDIENTS

Ingredients	CAS#	Wt (%)	ACGIH-TLVs (2004)	OSHA PELs (general industry) (2004)	NIOSH RELs (2004)	LD_{50} (rat, oral)	LC_{50} (rat, 4 hours)
Diesel fuel no. 1	68334-30-5	100	200 mg/m^3 TWA (total hydrocarbon vapour)	NAv for this product name or	100 mg/m^3 TWA	>5 g/kg	~5g/m^3
May contain:							
Benzene	71-43-2	Trace	0.5 ppm TWA 2.5 ppm STEL	1 ppm TWA 5 ppm STEL	0.1 ppm TWA 1.0 ppm STEL	930 mg/kg	13,200 ppm
May also contain:							
Sulphur	7704-34-9	Trace	NAv	NAv	NAv	>8.4 mg/kg	NAv
Which, under certain circumstances, may result in the evolution of:							
Hydrogen sulphide (H_2S)	7783-04-6	NAp	10 ppm TWA 15 ppm STEL	20 ppm CEILING	10 ppm CEILING	NAp	444 ppm

Arctic diesel is a complex mixture of hydrocarbons. Its exact composition depends on the source of the crude oil from which it was produced and the refining methods used. Arctic diesel contains hundreds of individual organic chemicals. This section identifies only some of the well-known chemical constituents.

SECTION 3 – PHYSICAL DATA

Form	Liquid	**Vapour**	10.5 mm Hg @ 38°C
Colour	Colourless to pale yellow	**Evaporation rate**	NAv
Odour	Kerosene-like	**Boiling point**	157 to 261°C (315 to 501°F)
Odour	Not available	**Freezing point**	- 47°C (- 53°F)
Specific gravity	0.81 @ 15°C	**pH**	NAp
Vapour density	4.5	**Coefficient of water/oil**	3.3 to >6(Log P_{oct})

SECTION 4 – FIRE AND EXPLOSION HAZARDS

Flammability ☒ Yes ☐ No **Conditions** Easily ignited by heat, sparks or flames.

Flash point	40°C (104°F) (cc)	**Auto ignition**	210°C (410°F)
Lower flammable limit	0.7%	**Upper flammable limit**	5%

Explosion data: Sensitivity **Mechanical impact** Not expected to be sensitive **Static discharge** Yes

Means of extinction: In general, do not extinguish fire unless flow can be stopped. Use carbon dioxide, dry chemical, or foam. Cool containers with flooding quantities of water until well after the fire is out.

Special precautions: Vapour is heavier than air. It will spread along the ground and collect in low or confined areas (sewers, basements, tanks). Vapour may travel to source of ignition and flash back. Containers may explode when heated.

Hazardous combustion products: Carbon monoxide. Nitrogen oxides. Aromatic hydrocarbons.

SECTION 5 – REACTIVITY INFORMATION

Stability	Stable
Conditions to avoid	Sources of ignition. Static discharges. High temperatures.
Incompatible substances	Oxidizers such as peroxides, nitric acid, and perchlorates.
Hazardous decomposition products	Carbon monoxide. Nitrogen oxides. Aromatic hydrocarbons. H_2S and sulphur dioxide (SO_2) may be produced from minor amounts of sulphur in the product.

SECTION 6 – HEALTH HAZARD INFORMATION

Route of Entry

- ☐ **Eye**
- ☒ **Skin absorption** Diesel fuel itself, as well as some components
- ☒ **Inhalation**
- ☒ **Ingestion**

Hazardous Contact

- ☐ **Eye**
- ☒ **Skin contact**

Acute exposure Headache and other symptoms of central nervous system (CNS) depression, such as nausea and dizziness, as well as burning sensation in chest following inhalation. Aspiration into the lungs can cause severe pneumonitis (serious lung irritation), chest pain, and/or pulmonary edema (swelling). Ingestion may produce nausea, vomiting, and cramping.

Note: H_2S may offgas from the product in confined spaces such as the headspace in tanks, even though the concentration of sulphur in the product is minimal. H_2S is very toxic. At concentrations as low as 1 to 5 ppm, nausea and severe eye irritation may occur. Sense of smell may be impaired at about 20 ppm, with headache and respiratory tract lung irritation. At 250 to 500 ppm, potentially fatal pulmonary edema (fluid in the lungs) may occur. Dizziness, sudden (often fatal) collapse, unconsciousness, and death occur at higher concentrations. Pulmonary edema may be delayed as long as 48 hours.

Chronic exposure Dermatitis. Possibly blood and nervous system disorders. Fatigue, and severe nervous and respiratory system symptoms may follow survival of H_2S poisoning.

Carcinogenicity Benzene is known to be carcinogenic.
Exposure to fuel oils during refining is considered "probably carcinogenic to humans".
IARC and NTP classify untreated and mildly treated mineral oils as known human carcinogens. ACGIH, EPA, NIOSH, and OSHA have not classified them.

Mutagenicity	Not known to be mutagenic
Sensitization	No
Irritancy	Skin, respiratory
Teratogenicity	NAv
Reproductive toxicity	NAv

Toxicologically synergistic Other CNS depressants can be expected to produce additive or synergistic effects. May increase photosensitizing ability of certain chemicals, such as dinitrochlorobenzene (DNCB).

SECTION 7 – FIRST AID

Inhalation Move victim to fresh air Give artificial respiration if breathing has stopped and if a qualified AR administrator is available. Apply CPR if both pulse and breathing have stopped. Obtain medical attention immediately.

Ingestion Never give anything by mouth if the person is unconscious, rapidly losing consciousness, or convulsing. If the person is conscious, have them drink 8 to 10 ounces of water or milk to dilute the material in the stomach. **Do not** induce vomiting. If vomiting occurs spontaneously, have the person lean forward to avoid aspiration. Obtain medical attention immediately.

Eye If irritation occurs, flush eye with lukewarm, gently flowing fresh water for at least 10 minutes.

Skin Quickly and gently blot away excess chemical. Gently remove contaminated clothing and shoes under running water. Wash gently and thoroughly with water and non-abrasive soap. Obtain medical assistance.

SECTION 8 – PRECAUTIONARY MEASURES

Do not attempt rescue of an H_2S knockdown victim without the use of proper respiratory protective equipment.

Personal protective equipment	**Gloves**	Nitrile, Viton™, polyethylene preferred.
	Eye	Chemical safety goggle or face shield, as a good general safety practice.
	Respiratory	NIOSH-approved. SCBA or air line respirator with escape cylinder for confined spaces or work with sulphur-containing product. A qualified occupational health and safety professional should advise on respirator selection. If an air-purifying respirator is appropriate, use organic vapour
	Clothing & footwear	Coveralls to prevent skin contact with product. If clothing or footwear becomes contaminated with product, completely decontaminate it before re-use, or discard it.

Engineering controls	Enclose processes. Use local exhaust ventilation to remove vapour at its site of generation. Handle laboratory samples in a fume hood. Use mechanical ventilation in confined spaces.
Handling procedures & equipment	Avoid heating open containers of product so as to minimize vapour production and accumulation. Use non-sparking equipment, explosion-proof ventilation, and intrinsically safe electrical equipment. Ground handling equipment. Have clean emergency eyewash and shower readily available in the work area.
Leak & spill procedure	Keep unauthorized persons away Eliminate all sources of ignition. Ventilate area. Stop leak if it can be done safely. Prevent entry into sewers, waterways, or confined spaces. Absorb or cover with dry earth, sand or other non-combustible material and use clean, non-sparking tools to transfer to container
Waste disposal	Consult local authorities for advice.
Storage	Cool, dry, well-ventilated area. No ignition sources. Containers should be vented and have flame
Shipping	Stable during transport. May be transported hot.

SECTION 9 – PREPARATION DATE OF MSDS

Prepared by	Irving Oil Limited, Refining Division	**Phone**	(506) 202-3000
Revision date	July 26, 2005	**To re-order MSDS,**	(506) 202-2000

SAFETY DATA SHEET

GASOLINE, UNLEADED

000003000644

Version 2.0 Revision Date 2017/04/20 Print Date 2017/04/20

SECTION 1. IDENTIFICATION

Product name	:	GASOLINE, UNLEADED
Synonyms	:	Regular, Unleaded Gasoline (US Grade), Mid-Grade, Plus, Super, WinterGas, SummerGas, Supreme, SuperClean, SuperClean WinterGas, RegularClean, PlusClean, Premium, marked or dyed gasoline, TQRUL, transitional quality regular unleaded, BOB, Blendstock for Oxygenate Blending, Conventional Gasoline, RUL, MUL, SUL, PUL.
Product code	:	100127, 100126, 101823, 100507, 101811, 101814, 100141, 101813, 101810, 101812, 100063, 101822, 100138, 101821, 100064, 101820, 101819, 100506, 101818, 101816, 101817, 100488
Manufacturer or supplier's details		Petro-Canada P.O. Box 2844, 150 - 6th Avenue South-West Calgary Alberta T2P 3E3 Canada
Emergency telephone number		Suncor Energy: +1 403-296-3000; Canutec Transportation: 1-888- 226-8832 (toll-free) or 613-996-6666; Poison Control Centre: Consult local telephone directory for emergency number(s).

Recommended use of the chemical and restrictions on use

Recommended use	:	Unleaded gasoline is used in spark ignition engines including motor vehicles, inboard and outboard boat engines, small engines such as chain saws and lawn mowers, and recreational vehicles.
Prepared by	:	Product Safety: +1 905-804-4752

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance	Clear liquid.
Colour	Clear to slightly yellow or green, undyed liquid. May be dyed red for taxation purposes.
Odour	Gasoline

GHS Classification

Flammable liquids	:	Category 1
Skin irritation	:	Category 2

Germ cell mutagenicity	:	Category 1B
Carcinogenicity	:	Category 1A
Reproductive toxicity	:	Category 2
Specific target organ toxicity - single exposure	:	Category 3 (Central nervous system)
Specific target organ toxicity - repeated exposure	:	Category 1
Aspiration hazard	:	Category 1

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Extremely flammable liquid and vapour.
May be fatal if swallowed and enters airways.
Causes skin irritation.
May cause drowsiness or dizziness.
May cause genetic defects.
May cause cancer.
Suspected of damaging the unborn child.
Causes damage to organs () through prolonged or repeated exposure.

Precautionary statements : **Prevention:**
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat/sparks/open flames/hot surfaces. No smoking.
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ ventilating/ lighting/ equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
Wash skin thoroughly after handling.
Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
Wear protective gloves/ protective clothing/ eye protection/ face protection.
Response:
IF SWALLOWED: Immediately call a POISON CENTER/doctor.
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
IF INHALED: Remove person to fresh air and keep comfortable

for breathing. Call a POISON CENTER/doctor if you feel unwell.
IF exposed or concerned: Get medical advice/ attention.
Do NOT induce vomiting.
If skin irritation occurs: Get medical advice/ attention.
Take off contaminated clothing and wash before reuse.
In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
Storage:
Store in a well-ventilated place. Keep container tightly closed.
Store in a well-ventilated place. Keep cool.
Store locked up.
Disposal:
Dispose of contents/ container to an approved waste disposal plant.

Potential Health Effects

Primary Routes of Entry	:	Eye contact Ingestion Inhalation Skin contact
Target Organs	:	Blood Immune system
Inhalation	:	Inhalation may cause central nervous system effects. Symptoms and signs include headache, dizziness, fatigue, muscular weakness, drowsiness and in extreme cases, loss of consciousness.
Skin	:	Causes skin irritation.
Eyes	:	May irritate eyes.
Ingestion	:	Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea. Aspiration hazard if swallowed - can enter lungs and cause damage.
Chronic Exposure	:	Chronic exposure to benzene may result in increased risk of leukemia and other blood disorders.
Aggravated Medical Condition	:	None known.

Other hazards
None known.

IARC	Group 1: Carcinogenic to humans	
	Benzene	71-43-2
OSHA	OSHA specifically regulated carcinogen	
	Benzene	71-43-2

NTP	Known to be human carcinogen	
	Benzene	71-43-2

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

Hazardous components

Chemical name	CAS-No.	Concentration
gasoline, natural	8006-61-9	95 - 100 %
toluene	108-88-3	1 - 40 %
benzene	71-43-2	0.5 - 1.5 %
ethanol	64-17-5	0.1 - 0.3 %

SECTION 4. FIRST AID MEASURES

If inhaled : Artificial respiration and/or oxygen may be necessary.
Move to fresh air.
Seek medical advice.

In case of skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Wash skin thoroughly with soap and water or use recognized skin cleanser.
Wash clothing before reuse.
Seek medical advice.

In case of eye contact : Remove contact lenses.
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
Obtain medical attention.

If swallowed : Rinse mouth with water.
DO NOT induce vomiting unless directed to do so by a physician or poison control center.
Never give anything by mouth to an unconscious person.
Seek medical advice.

Most important symptoms and effects, both acute and delayed : None known.

Protection of first-aiders : First Aid responders should pay attention to self-protection and use the recommended protective clothing
It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Dry chemical Carbon dioxide (CO2) Water fog. Foam
Unsuitable extinguishing media	:	Do NOT use water jet.
Specific hazards during fire-fighting	:	Cool closed containers exposed to fire with water spray.
Hazardous combustion products	:	Carbon oxides (CO, CO2), nitrogen oxides (NOx), polynuclear aromatic hydrocarbons, phenols, aldehydes, ketones, smoke and irritating vapours as products of incomplete combustion.
Further information	:	Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Use personal protective equipment. Ensure adequate ventilation. Evacuate personnel to safe areas. Material can create slippery conditions.
Environmental precautions	:	If the product contaminates rivers and lakes or drains inform respective authorities.
Methods and materials for containment and cleaning up	:	Prevent further leakage or spillage if safe to do so. Remove all sources of ignition. Soak up with inert absorbent material. Non-sparking tools should be used. Ensure adequate ventilation. Contact the proper local authorities.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling	:	For personal protection see section 8. Smoking, eating and drinking should be prohibited in the application area. Use only with adequate ventilation. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid spark promoters. Ground/bond container and equipment. These alone may be insufficient to remove static electricity. Avoid contact with skin, eyes and clothing. Do not ingest. Keep away from heat and sources of ignition. Keep container closed when not in use.

Conditions for safe storage : Store in original container.
Containers which are opened must be carefully resealed and kept upright to prevent leakage.
Keep in a dry, cool and well-ventilated place.
Keep in properly labelled containers.
To maintain product quality, do not store in heat or direct sunlight.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
gasoline, natural	8006-61-9	TWA	300 ppm 900 mg/m3	OSHA P0
		STEL	500 ppm 1,500 mg/m3	OSHA P0
		TWA	500 ppm 2,000 mg/m3	OSHA Z-1
		STEL	500 ppm 1,500 mg/m3	CAL PEL
		PEL	300 ppm 900 mg/m3	CAL PEL
toluene	108-88-3	TWA	20 ppm	ACGIH
		TWA	100 ppm 375 mg/m3	NIOSH REL
		ST	150 ppm 560 mg/m3	NIOSH REL
		TWA	200 ppm	OSHA Z-2
		CEIL	300 ppm	OSHA Z-2
		Peak	500 ppm (10 minutes)	OSHA Z-2
		TWA	100 ppm 375 mg/m3	OSHA P0
		STEL	150 ppm 560 mg/m3	OSHA P0
		PEL	10 ppm 37 mg/m3	CAL PEL
		C	500 ppm	CAL PEL
		STEL	150 ppm 560 mg/m3	CAL PEL
benzene	71-43-2	TWA	0.5 ppm	ACGIH
		STEL	2.5 ppm	ACGIH
		TWA	0.1 ppm	NIOSH REL
		ST	1 ppm	NIOSH REL
		TWA	10 ppm	OSHA Z-2
		CEIL	25 ppm	OSHA Z-2
		Peak	50 ppm (10 minutes)	OSHA Z-2
		PEL	1 ppm	OSHA CARC
		STEL	5 ppm	OSHA CARC

		PEL	1 ppm	CAL PEL
		STEL	5 ppm	CAL PEL
ethanol	64-17-5	TWA	1,000 ppm 1,900 mg/m3	NIOSH REL
		TWA	1,000 ppm 1,900 mg/m3	OSHA Z-1
		TWA	1,000 ppm 1,900 mg/m3	OSHA P0
		STEL	1,000 ppm	ACGIH
		PEL	1,000 ppm 1,900 mg/m3	CAL PEL

Biological occupational exposure limits

Components	CAS-No.	Control parameters	Biological specimen	Sam-pling time	Permissible concentra-tion	Basis
Toluene	108-88-3	Toluene	In blood	Prior to last shift of work-week	0.02 mg/l	ACGIH BEI
		Toluene	Urine	End of shift (As soon as possible after exposure ceases)	0.03 mg/l	ACGIH BEI

Engineering measures : Use only in well-ventilated areas.
Ensure that eyewash station and safety shower are proximal to the work-station location.

Personal protective equipment

Respiratory protection : Use respiratory protection unless adequate local exhaust ventilation is provided or exposure assessment demonstrates that exposures are within recommended exposure guidelines. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Filter type : A NIOSH-approved air-purifying respirator with an organic vapour cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. Use a positive-pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circum-stances where air-purifying respirators may not provide ade-quate protection.

Hand protection
Material : polyvinyl alcohol (PVA), Viton(R). Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns. It should be realized that eventually any material regardless of their imperviousness,

		will get permeated by chemicals. Therefore, protective gloves should be regularly checked for wear and tear. At the first signs of hardening and cracks, they should be changed.
Remarks	:	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Eye protection	:	Wear face-shield and protective suit for abnormal processing problems.
Skin and body protection	:	Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place.
Protective measures	:	Wash contaminated clothing before re-use.
Hygiene measures	:	Remove and wash contaminated clothing and gloves, including the inside, before re-use. Wash face, hands and any exposed skin thoroughly after handling.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	Clear liquid.
Colour	:	Clear to slightly yellow or green, undyed liquid. May be dyed red for taxation purposes.
Odour	:	Gasoline
Odour Threshold	:	No data available
pH	:	No data available
Pour point	:	No data available
Boiling point/boiling range	:	25 - 225 °C (77 - 437 °F)
Flash point	:	-50 - -38 °C (-58 - -36 °F) Method: Tagliabue.
Auto-Ignition Temperature	:	257 °C (495 °F)
Evaporation rate	:	No data available
Flammability	:	Extremely flammable in presence of open flames, sparks, shocks, and heat. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. Rapid escape of vapour may generate static charge causing ignition. May accumulate in confined spaces.
Upper explosion limit	:	7.6 %(V)

Lower explosion limit	:	1.3 %(V)
Vapour pressure	:	< 802.5 mmHg (20 °C / 68 °F)
Relative vapour density	:	3
Relative density	:	0.685 - 0.8
Solubility(ies)		
Water solubility	:	insoluble
Partition coefficient: n-octanol/water	:	No data available
Viscosity		
Explosive properties	:	Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Containers may explode in heat of fire. Vapours may form explosive mixtures with air.

SECTION 10. STABILITY AND REACTIVITY

Possibility of hazardous reactions	:	Hazardous polymerisation does not occur. Stable under normal conditions.
Conditions to avoid	:	Extremes of temperature and direct sunlight.
Incompatible materials	:	Reactive with oxidising agents, acids and interhalogens.
Hazardous decomposition products	:	May release COx, NOx, phenols, polycyclic aromatic hydrocarbons, aldehydes, ketones, smoke and irritating vapours when heated to decomposition.

SECTION 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure
Eye contact
Ingestion
Inhalation
Skin contact

Acute toxicity

Product:

Acute oral toxicity	:	Remarks: No data available
Acute inhalation toxicity	:	Remarks: No data available
Acute dermal toxicity	:	Remarks: No data available

Components:

toluene:

Acute oral toxicity	:	LD50 (Rat): 5,580 mg/kg,
Acute inhalation toxicity	:	LC50 (Rat): 7585 ppm Exposure time: 4 h Test atmosphere: dust/mist
Acute dermal toxicity	:	LD50 (Rabbit): 12,125 mg/kg,

benzene:

Acute oral toxicity	:	LD50 (Rat): 2,990 mg/kg,
Acute inhalation toxicity	:	LC50 (Rat): 13700 ppm Exposure time: 4 h Test atmosphere: dust/mist
Acute dermal toxicity	:	LD50 (Rabbit): > 8,240 mg/kg,

ethanol:

Acute oral toxicity	:	LD50 (Rat): 7,060 mg/kg,
Acute inhalation toxicity	:	LC50 (Rat): > 32380 ppm Exposure time: 4 h Test atmosphere: vapour

Skin corrosion/irritation

Product:

Remarks: No data available

Serious eye damage/eye irritation

Product:

Remarks: No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

STOT - single exposure

No data available

STOT - repeated exposure

No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Product:

Toxicity to fish	:	Remarks: No data available
Toxicity to daphnia and other aquatic invertebrates	:	Remarks: No data available
Toxicity to algae	:	Remarks: No data available
Toxicity to bacteria	:	Remarks: No data available

Persistence and degradability

Product:

Biodegradability	:	Remarks: No data available

Bioaccumulative potential

No data available

Mobility in soil

No data available

Other adverse effects

No data available

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	The product should not be allowed to enter drains, water courses or the soil. Offer surplus and non-recyclable solutions to a licensed disposal company. Waste must be classified and labelled prior to recycling or disposal. Send to a licensed waste management company. Dispose of as hazardous waste in compliance with local and national regulations. Dispose of product residue in accordance with the instructions of the person responsible for waste disposal.
Contaminated packaging	:	Do not re-use empty containers.

SECTION 14. TRANSPORT INFORMATION

International Regulations

IATA-DGR

UN/ID No.	:	UN 1203
Proper shipping name	:	Gasoline
Class	:	3
Packing group	:	II
Labels	:	Class 3 - Flammable Liquid
Packing instruction (cargo aircraft)	:	364

IMDG-Code

UN number	:	UN 1203
Proper shipping name	:	GASOLINE
Class	:	3
Packing group	:	II
Labels	:	3
EmS Code	:	F-E, S-E
Marine pollutant	:	no

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

National Regulations

49 CFR

UN/ID/NA number	:	UN 1203
Proper shipping name	:	Gasoline
Class	:	3
Packing group	:	II
Labels	:	Class 3 - Flammable Liquid
ERG Code	:	128
Marine pollutant	:	no

SECTION 15. REGULATORY INFORMATION

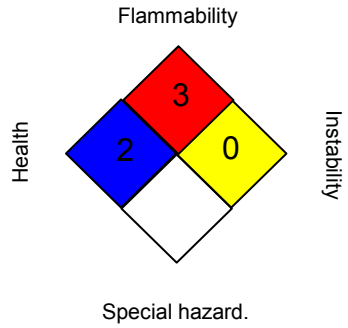
The components of this product are reported in the following inventories:

DSL	On the inventory, or in compliance with the inventory
TSCA	All chemical substances in this product are either listed on the TSCA Inventory or are in compliance with a TSCA Inventory exemption.
EINECS	On the inventory, or in compliance with the inventory

SECTION 16. OTHER INFORMATION

Further information

NFPA:



HMIS III:

HEALTH	3*
FLAMMABILITY	3
PHYSICAL HAZARD	0
PERSONAL PROTECTION	H

0 = not significant, 1 =Slight,
2 = Moderate, 3 = High
4 = Extreme, * = Chronic

For Copy of SDS : Internet: www.petro-canada.ca/msds
Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228
For Product Safety Information: 1 905-804-4752

Prepared by : Product Safety: +1 905-804-4752

Revision Date : 2017/04/20

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

SAFETY DATA SHEET

JET A/A-1 AVIATION TURBINE FUEL

000003001081

Version 2.0 Revision Date 2016/07/20 Print Date 2016/07/20

SECTION 1. IDENTIFICATION

Product name	:	JET A/A-1 AVIATION TURBINE FUEL
Synonyms	:	Jet A-1; Jet A-1-DI; Aviation Turbine Kerosene (ATK); JP-8; NATO F-34; Jet F-34; Aviation Turbine Fuel, Kerosene Type (CAN/CGSB 3.23 & CAN/CGSB 3.24)
Product code	:	101851, 100123
Manufacturer or supplier's details		Petro-Canada P.O. Box 2844, 150 - 6th Avenue South-West Calgary Alberta T2P 3E3 Canada
Emergency telephone number		Suncor Energy: +1 403-296-3000; Poison Control Centre: Consult local telephone directory for emergency number(s).

Recommended use of the chemical and restrictions on use

Recommended use	:	Used as aviation turbine fuel. May contain a fuel system icing inhibitor. In the arctic, Jet A-1 may also be used as diesel fuel (if it contains a lubricity additive) and heating oil.
Prepared by	:	Product Safety: +1 905-804-4752

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance	Clear liquid.
Colour	Clear and colourless
Odour	Kerosene-like.

GHS Classification

Flammable liquids	:	Category 3
Skin irritation	:	Category 2
Reproductive toxicity	:	Category 2
Specific target organ toxicity - single exposure	:	Category 3 (Central nervous system)
Aspiration hazard	:	Category 1

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Flammable liquid and vapour.
May be fatal if swallowed and enters airways.
Causes skin irritation.
May cause drowsiness or dizziness.
Suspected of damaging fertility or the unborn child.

Precautionary statements : **Prevention:**
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat/sparks/open flames/hot surfaces. No smoking.
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ ventilating/ lighting/ equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
Wash skin thoroughly after handling.
Use only outdoors or in a well-ventilated area.
Wear protective gloves/ eye protection/ face protection.
Use personal protective equipment as required.
Response:
IF SWALLOWED: Immediately call a POISON CENTER/doctor.
IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell.
IF exposed or concerned: Get medical advice/ attention.
Do NOT induce vomiting.
If skin irritation occurs: Get medical advice/ attention.
Take off contaminated clothing and wash before reuse.
In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
Storage:
Store in a well-ventilated place. Keep container tightly closed.
Store in a well-ventilated place. Keep cool.
Store locked up.
Disposal:
Dispose of contents/ container to an approved waste disposal plant.

Potential Health Effects

Primary Routes of Entry : Eye contact
Ingestion
Inhalation

Skin contact

Inhalation : Inhalation may cause central nervous system effects. Symptoms and signs include headache, dizziness, fatigue, muscular weakness, drowsiness and in extreme cases, loss of consciousness.

Skin : May irritate skin.

Eyes : May irritate eyes.

Ingestion : Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.
Aspiration hazard if swallowed - can enter lungs and cause damage.

Aggravated Medical Condition : None known.

Other hazards

None known.

IARC No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

OSHA No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

NTP No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

Hazardous components

Chemical name	CAS-No.	Concentration
kerosine (petroleum)	8008-20-6	90 - 100 %
2-(2-methoxyethoxy)ethanol	111-77-3	0 - 0.2 %

SECTION 4. FIRST AID MEASURES

If inhaled : Move to fresh air.
Artificial respiration and/or oxygen may be necessary.
Seek medical advice.

In case of skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing

		and shoes. Wash skin thoroughly with soap and water or use recognized skin cleanser. Wash clothing before reuse. Seek medical advice.
In case of eye contact	:	Remove contact lenses. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.
If swallowed	:	Rinse mouth with water. DO NOT induce vomiting unless directed to do so by a physician or poison control center. Never give anything by mouth to an unconscious person. Seek medical advice.
Most important symptoms and effects, both acute and delayed	:	First aider needs to protect himself.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Dry chemical Carbon dioxide (CO2) Water fog. Foam
Unsuitable extinguishing media	:	Do NOT use water jet.
Specific hazards during firefighting	:	Cool closed containers exposed to fire with water spray.
Hazardous combustion products	:	Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), smoke and irritating vapours as products of incomplete combustion.
Further information	:	Prevent fire extinguishing water from contaminating surface water or the ground water system.
Special protective equipment for firefighters	:	Wear self-contained breathing apparatus for firefighting if necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Use personal protective equipment. Ensure adequate ventilation. Evacuate personnel to safe areas. Material can create slippery conditions.
Environmental precautions	:	If the product contaminates rivers and lakes or drains inform respective authorities.

Methods and materials for containment and cleaning up	:	Prevent further leakage or spillage if safe to do so. Remove all sources of ignition. Soak up with inert absorbent material. Non-sparking tools should be used. Ensure adequate ventilation. Contact the proper local authorities.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling	:	For personal protection see section 8. Smoking, eating and drinking should be prohibited in the application area. Use only with adequate ventilation. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid spark promoters. Ground/bond container and equipment. These alone may be insufficient to remove static electricity. Avoid contact with skin, eyes and clothing. Do not ingest. Keep away from heat and sources of ignition. Keep container closed when not in use.
Conditions for safe storage	:	Store in original container. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Keep in a dry, cool and well-ventilated place. Keep in properly labelled containers. To maintain product quality, do not store in heat or direct sunlight.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
kerosine (petroleum)	8008-20-6	TWA	100 mg/m3	NIOSH REL
		TWA	500 ppm 2,000 mg/m3	OSHA Z-1
		TWA	200 mg/m3 (total hydrocarbon vapor)	ACGIH
		TWA	400 ppm 1,600 mg/m3	OSHA P0

Engineering measures	:	Use only in well-ventilated areas. Ensure that eyewash station and safety shower are proximal to the work-station location.

Personal protective equipment

Respiratory protection	:	Use respiratory protection unless adequate local exhaust ventilation is provided or exposure assessment demonstrates that exposures are within recommended exposure guidelines. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.
Filter type	:	A NIOSH-approved air-purifying respirator with an organic vapour cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. Use a positive-pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstances where air-purifying respirators may not provide adequate protection.
Hand protection		
Material	:	polyvinyl alcohol (PVA), Viton(R). Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns. It should be realized that eventually any material regardless of their imperviousness, will get permeated by chemicals. Therefore, protective gloves should be regularly checked for wear and tear. At the first signs of hardening and cracks, they should be changed.
Remarks	:	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Eye protection	:	Wear face-shield and protective suit for abnormal processing problems.
Skin and body protection	:	Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place.
Protective measures	:	Wash contaminated clothing before re-use.
Hygiene measures	:	Remove and wash contaminated clothing and gloves, including the inside, before re-use. Wash face, hands and any exposed skin thoroughly after handling.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	Clear liquid.
Colour	:	Clear and colourless
Odour	:	Kerosene-like.
Odour Threshold	:	No data available

pH	:	No data available
Pour point	:	-51 °C (-60 °F)No data available
Boiling point/boiling range	:	140 - 300 °C (284 - 572 °F)
Flash point	:	> 38 °C (100 °F) Method: Tagliabue
Auto-Ignition Temperature	:	210 °C (410 °F)
Evaporation rate	:	No data available
Flammability	:	Flammable in presence of open flames, sparks and heat. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. This product can accumulate static charge and ignite. May accumulate in confined spaces.
Upper explosion limit	:	5 %(V)
Lower explosion limit	:	0.7 %(V)
Vapour pressure	:	5.25 mmHg (20 °C / 68 °F)
Relative vapour density	:	4.5
Relative density	:	0.775 - 0.84 (15 °C / 59 °F)
Solubility(ies)		
Water solubility	:	No data available
Partition coefficient: n-octanol/water	:	No data available
Viscosity		
Viscosity, kinematic	:	1.0 - 1.9 cSt (40 °C / 104 °F)
Explosive properties	:	Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Containers may explode in heat of fire.

SECTION 10. STABILITY AND REACTIVITY

Possibility of hazardous reactions	:	Hazardous polymerisation does not occur. Stable under normal conditions.
Conditions to avoid	:	Extremes of temperature and direct sunlight.

Incompatible materials	:	Reactive with oxidising agents, acids and alkalis.
Hazardous decomposition products	:	May release COx, NOx, SOx, aldehydes, acids, ketones, smoke and irritating vapours when heated to decomposition.

SECTION 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure
Eye contact
Ingestion
Inhalation
Skin contact

Acute toxicity

Product:

Acute oral toxicity	:	Remarks: No data available
Acute inhalation toxicity	:	Remarks: No data available
Acute dermal toxicity	:	Remarks: No data available

Components:

kerosine (petroleum):

Acute oral toxicity	:	LD50 (Rat): > 5,000 mg/kg,
Acute inhalation toxicity	:	LC50 (Rat): > 5 mg/l Exposure time: 4 h Test atmosphere: dust/mist
Acute dermal toxicity	:	LD50 (Rabbit): > 2,000 mg/kg,

Skin corrosion/irritation

Product:
Remarks: No data available

Serious eye damage/eye irritation

Product:
Remarks: No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity
No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

STOT - single exposure

No data available

STOT - repeated exposure

No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Product:

Toxicity to fish	:	Remarks: No data available
Toxicity to daphnia and other aquatic invertebrates	:	Remarks: No data available
Toxicity to algae	:	Remarks: No data available
Toxicity to bacteria	:	Remarks: No data available

Persistence and degradability

Product:

Biodegradability	:	Remarks: No data available

Bioaccumulative potential

No data available

Mobility in soil

No data available

Other adverse effects

No data available

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	The product should not be allowed to enter drains, water courses or the soil. Offer surplus and non-recyclable solutions to a licensed disposal company. Waste must be classified and labelled prior to recycling or disposal. Send to a licensed waste management company. Dispose of product residue in accordance with the instructions of the person responsible for waste disposal.

Contaminated packaging : Do not re-use empty containers.

SECTION 14. TRANSPORT INFORMATION

International Regulations

IATA-DGR

UN/ID No.	:	UN 1863
Proper shipping name	:	Fuel, aviation, turbine engine
Class	:	3
Packing group	:	III
Labels	:	Class 3 - Flammable Liquid
Packing instruction (cargo aircraft)	:	366

IMDG-Code

UN number	:	UN 1863
Proper shipping name	:	FUEL, AVIATION, TURBINE ENGINE
Class	:	3
Packing group	:	III
Labels	:	3
EmS Code	:	F-E, S-E
Marine pollutant	:	no

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

National Regulations

49 CFR

UN/ID/NA number	:	UN 1863
Proper shipping name	:	Fuel, aviation, turbine engine
Class	:	3
Packing group	:	III
Labels	:	Class 3 - Flammable Liquid
ERG Code	:	128
Marine pollutant	:	no

SECTION 15. REGULATORY INFORMATION

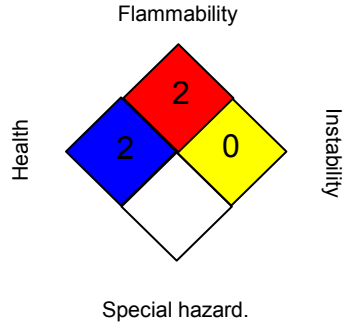
The components of this product are reported in the following inventories:

DSL	On the inventory, or in compliance with the inventory
TSCA	All chemical substances in this product are either listed on the TSCA Inventory or are in compliance with a TSCA Inventory exemption.
EINECS	On the inventory, or in compliance with the inventory

SECTION 16. OTHER INFORMATION

Further information

NFPA:



HMIS III:

HEALTH	2*
FLAMMABILITY	2
PHYSICAL HAZARD	0
PERSONAL PROTECTION	H

0 = not significant, 1 =Slight,
2 = Moderate, 3 = High
4 = Extreme, * = Chronic

For Copy of (M)SDS : Internet: www.petro-canada.ca/msds
Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228
For Product Safety Information: 1 905-804-4752

Prepared by : Product Safety: +1 905-804-4752

Revision Date : 2016/07/20

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SAFETY DATA SHEET

SECTION 1 IDENTIFICATION

PRODUCT

Product Name: **UNIVIS N 32**
Product Description: Base Oil and Additives
SDS Number: 22832
Product Code: 201560109740
Intended Use: Hydraulic fluid

COMPANY IDENTIFICATION

Supplier: **Imperial Oil Downstream**
P.O. Box 2480, Station M
Calgary, ALBERTA T2P 3M9 Canada

24 Hour Emergency Telephone	1-866-232-9563
Transportation Emergency Phone Number	1-866-232-9563
Product Technical Information	1-800-268-3183
Supplier General Contact	1-800-567-3776

SECTION 2 HAZARD IDENTIFICATION

This material is considered to be NON-HAZARDOUS according to regulatory guidelines.

This product has been classified in accordance with hazard criteria of the Hazardous Products Regulations (HPR) SOR/2015-17 and the SDS contains all the information required by the HPR SOR/2015-17.

Other hazard information:

Health Hazards Not Otherwise Classified: None as defined under HPR SOR/2015-17.

Physical Hazards Not Otherwise Classified: None as defined under HPR SOR/2015-17.

PHYSICAL / CHEMICAL HAZARDS

No significant hazards.

HEALTH HAZARDS

High-pressure injection under skin may cause serious damage. Excessive exposure may result in eye, skin, or respiratory irritation.

ENVIRONMENTAL HAZARDS

No significant hazards.

NFPA Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0
HMIS Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

This material is defined as a mixture.

Substance(s) or Complex Substance(s)

Name	CAS#	Concentration*	GHS Hazard Codes
2,6-DI-TERT-BUTYLPHENOL	128-39-2	0.1 - < 0.25%	H315, H400(M factor 1), H410(M factor 1)
LUBRICATING OILS (PETROLEUM), HYDROTREATED NEUTRAL OIL-BASED	72623-86-0	1 - < 5%	H304
SOLVENT DEWAXED HEAVY PARAFFINIC DISTILLATE	64742-65-0	60 - < 70%	H304
ZINC, BIS[O,O-BIS(2-ETHYLHEXYL) PHOPSHORODITHIOATO-KS,KS']-, (T-4)-	4259-15-8	0.1 - < 1%	H318, H401, H411

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

SECTION 4 FIRST-AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

First aid is normally not required. Seek medical attention if discomfort occurs.

SECTION 5 FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight streams of water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent run-off from fire control or dilution from entering streams, sewers or drinking water supply. Fire-fighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Unusual Fire Hazards: Pressurised mists may form a flammable mixture.

Hazardous Combustion Products: Aldehydes, Incomplete combustion products, Oxides of carbon, Smoke, Fume, Sulphur oxides

FLAMMABILITY PROPERTIES

Flash Point [Method]: >190°C (374°F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

PROTECTIVE MEASURES

Avoid contact with spilled material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders.

For emergency responders: Respiratory protection: respiratory protection will be necessary only in special cases, e.g., formation of mists. Half-face or full-face respirator with filter(s) for dust/organic vapor or Self Contained Breathing Apparatus (SCBA) can be used depending on the size of spill and potential level of exposure. If the exposure cannot be completely characterized or an oxygen deficient atmosphere is possible or anticipated, SCBA is recommended. Work gloves that are resistant to hydrocarbons are recommended. Gloves made of polyvinyl acetate (PVA) are not water-resistant and are not suitable for emergency use. Chemical goggles are recommended if splashes or contact with eyes is possible. Small spills: normal antistatic work clothes are usually adequate. Large spills: full body suit of chemical resistant, antistatic material is recommended.

SPILL MANAGEMENT

Land Spill: Stop leak if you can do so without risk. Recover by pumping or with suitable absorbent.

Water Spill: Stop leak if you can do so without risk. Confine the spill immediately with booms. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dyke far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). When the material is handled in bulk, an electrical spark could ignite any flammable vapors from liquids or residues that may be present (e.g., during switch-loading operations). Use proper bonding and/or earthing procedures. However, bonding and earthing may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

Static Accumulator: This material is a static accumulator.

STORAGE

The type of container used to store the material may affect static accumulation and dissipation. Do not store in open or unlabelled containers. Keep away from incompatible materials.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMIT VALUES

Substance Name	Form	Limit/Standard			Note	Source
LUBRICATING OILS (PETROLEUM), HYDROTREATED NEUTRAL OIL-BASED	Inhalable fraction.	TWA	5 mg/m3			ACGIH
SOLVENT DEWAXED HEAVY PARAFFINIC DISTILLATE	Inhalable fraction.	TWA	5 mg/m3			ACGIH

Exposure limits/standards for materials that can be formed when handling this product: When mists/aerosols can occur the following is recommended: 5 mg/m³ - ACGIH TLV (inhalable fraction).

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

No special requirements under ordinary conditions of use and with adequate ventilation.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

No special requirements under ordinary conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapour warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

No protection is ordinarily required under normal conditions of use.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection:

No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practise good housekeeping.

ENVIRONMENTAL CONTROLS

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit emissions.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Note: Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

GENERAL INFORMATION

Physical State: Liquid
Colour: Amber
Odour: Characteristic
Odour Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 °C): 0.873
Flammability (Solid, Gas): N/A
Flash Point [Method]: >190°C (374°F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D
Boiling Point / Range: > 316°C (600°F)
Decomposition Temperature: N/D
Vapour Density (Air = 1): > 2 at 101 kPa
Vapour Pressure: < 0.013 kPa (0.1 mm Hg) at 20ºC
Evaporation Rate (n-butyl acetate = 1): N/D
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3.5
Solubility in Water: Negligible
Viscosity: 32 cSt (32 mm2/sec) at 40ºC | 6.99 cSt (6.99 mm2/sec) at 100°C [ASTM D 445]
Oxidizing Properties: See Hazards Identification Section.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/A
Pour Point: -39°C (-38°F)
DMSO Extract (mineral oil only), IP-346: < 3 %wt

SECTION 10 STABILITY AND REACTIVITY

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Excessive heat. High energy sources of ignition.

MATERIALS TO AVOID: Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

POSSIBILITY OF HAZARDOUS REACTIONS: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

INFORMATION ON TOXICOLOGICAL EFFECTS

Hazard Class	Conclusion / Remarks
Inhalation	
Acute Toxicity: No end point data for material.	Minimally Toxic. Based on assessment of the components.
Irritation: No end point data for material.	Negligible hazard at ambient/normal handling temperatures.
Ingestion	
Acute Toxicity: No end point data for material.	Minimally Toxic. Based on assessment of the components.
Skin	
Acute Toxicity: No end point data for material.	Minimally Toxic. Based on assessment of the components.
Skin Corrosion/Irritation: No end point data for material.	Negligible irritation to skin at ambient temperatures. Based on assessment of the components.
Eye	
Serious Eye Damage/Irritation: No end point data for material.	May cause mild, short-lasting discomfort to eyes. Based on assessment of the components.
Sensitisation	
Respiratory Sensitization: No end point data for material.	Not expected to be a respiratory sensitizer.
Skin Sensitization: No end point data for material.	Not expected to be a skin sensitizer. Based on assessment of the components.
Aspiration: Data available.	Not expected to be an aspiration hazard. Based on physico-chemical properties of the material.
Germ Cell Mutagenicity: No end point data for material.	Not expected to be a germ cell mutagen. Based on assessment of the components.
Carcinogenicity: No end point data for material.	Not expected to cause cancer. Based on assessment of the components.
Reproductive Toxicity: No end point data for material.	Not expected to be a reproductive toxicant. Based on assessment of the components.
Lactation: No end point data for material.	Not expected to cause harm to breast-fed children.
Specific Target Organ Toxicity (STOT)	
Single Exposure: No end point data for material.	Not expected to cause organ damage from a single exposure.
Repeated Exposure: No end point data for material.	Not expected to cause organ damage from prolonged or repeated exposure. Based on assessment of the components.

OTHER INFORMATION

Contains:
Base oil severely refined: Not carcinogenic in animal studies. Representative material passes IP-346, Modified Ames test, and/or other screening tests. Dermal and inhalation studies showed minimal effects; lung non-specific infiltration of immune cells, oil deposition and minimal granuloma formation. Not sensitising in test animals.

CMR Status: None.

Chemical Name	CAS Number	List Citations
LUBRICATING OILS (PETROLEUM),	72623-86-0	4

HYDROTREATED NEUTRAL OIL-BASED		

--REGULATORY LISTS SEARCHED--

1 = IARC 1
2 = IARC 2A
3 = IARC 2B
4 = ACGIH ALL
5 = ACGIH A1
6 = ACGIH A2

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data for the material, components of the material, or for similar materials, through the application of bridging principals.

ECOTOXICITY

Material -- Not expected to be harmful to aquatic organisms.

MOBILITY

Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Base oil component -- Expected to be inherently biodegradable

BIOACCUMULATION POTENTIAL

Base oil component -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products. Protect the environment. Dispose of used oil at designated sites. Minimize skin contact. Do not mix used oils with solvents, brake fluids or coolants.

REGULATORY DISPOSAL INFORMATION

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty

drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (TDG): Not Regulated for Land Transport

LAND (DOT): Not Regulated for Land Transport

SEA (IMDG): Not Regulated for Sea Transport according to IMDG-Code

Marine Pollutant: No

AIR (IATA): Not Regulated for Air Transport

SECTION 15 REGULATORY INFORMATION

CEPA: All components of this product are either on the Domestic Substance List (DSL) or are exempt.

Listed or exempt from listing/notification on the following chemical inventories (May contain substance(s) subject to notification to the EPA Active TSCA inventory prior to import to USA): AICS, DSL, ENCS, IECSC, KECI, PICCS, TCSI, TSCA

The Following Ingredients are Cited on the Lists Below: None.

--REGULATORY LISTS SEARCHED--

1 = TSCA 4	3 = TSCA 5e	5 = TSCA 12b
2 = TSCA 5a2	4 = TSCA 6	6 = NPRI

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

KEY TO THE H-CODES CONTAINED IN SECTION 3 OF THIS DOCUMENT (for information only):
H304: May be fatal if swallowed and enters airways; Aspiration, Cat 1
H315: Causes skin irritation; Skin Corr/Irritation, Cat 2
H318: Causes serious eye damage; Serious Eye Damage/Irr, Cat 1
H400: Very toxic to aquatic life; Acute Env Tox, Cat 1
H401: Toxic to aquatic life; Acute Env Tox, Cat 2
H410: Very toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 1
H411: Toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 2

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:
Updates made in accordance with implementation of GHS requirements.

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DGN: 7187360 (1027526)

Comet Chemical Company Ltd.
3463 Thomas Street
Innisfill, ON L9S 3W4
Canada
Information (M-F 8:00-5:00): 705-436-5580

SAFETY DATA SHEET

SECTION 1. IDENTIFICATION

Product identifier used on the label

Ethylene Glycol (antifreeze)

Product Code(s) : Not available.

Recommended use of the chemical and restrictions on use

: Antifreeze; Plasticiser; Solvent
Use pattern: Professional Use Only
Restriction on use: None known

Chemical family : Glycols.

Name, address, and telephone number of the supplier:

Comet Chemical Company Ltd.
3463 Thomas Street

Innisfill, ON, Canada
L9S 3W4
Supplier's Telephone # : 705-436-5580

Name, address, and telephone number of the manufacturer:

Refer to supplier

24 Hr. Emergency Tel # : TERRRAPURE ENVIRONMENTAL : 800-567-7455

SECTION 2. HAZARDS IDENTIFICATION

Classification of the chemical

Clear colourless liquid. Odorless.

This material is classified as hazardous under U.S. OSHA regulations (29CFR 1910.1200) (Hazcom 2012) and Canadian WHMIS regulations (Hazardous Products Regulations) (WHMIS 2015).
Hazard classification
Acute toxicity, oral - Category 4
Reproductive toxicity- Category 2
Specific target organ toxicity, single exposure - Category 2 (kidneys)
Specific Target Organ Toxicity, Single Exposure - Category 3 (cns)

Label elements

Hazard pictogram(s)

Signal Word

Warning!

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Hazard statement(s)

Harmful if swallowed.
Suspected of damaging the unborn child.
May cause damage to the kidneys if swallowed.
May cause drowsiness or dizziness.

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SAFETY DATA SHEET

Precautionary statement(s)

Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Wash hands thoroughly after handling.
Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
Do not breathe mist or vapor.
Wear protective gloves/clothing and eye/face protection.
If exposed or concerned: Call a POISON CENTER or doctor/physician.

IF SWALLOWED: Call a POISON CENTRE or doctor/physician if you feel unwell.
Rinse mouth.
If inhaled: Remove person to fresh air and keep comfortable for breathing.
Call a POISON CENTER or doctor/physician if you feel unwell.

Store locked up.
Store in a well-ventilated place. Keep container tightly closed.

Dispose of contents/container in accordance with local/regional/national/international regulations.

Other hazards

Other hazards which do not result in classification:
May cause eye, skin and respiratory tract irritation.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Pure substance

Chemical name	Common name and synonyms	CAS #	Concentration
Ethylene glycol	1,2-Ethanediol 1,2-Dihydroxyethane EG	107-21-1	**100.00**

SECTION 4. FIRST-AID MEASURES

Description of first aid measures

Ingestion : Call a physician or poison control centre immediately. Induce vomiting ONLY under the direct supervision of qualified medical personnel or a poison control centre. Never give anything by mouth to an unconscious person.

Inhalation : Immediately remove person to fresh air. If breathing has stopped, give artificial respiration. Get medical attention.

Skin contact : Immediately flush with plenty of water, while removing contaminated clothing. If irritation persists, seek prompt medical attention. Launder clothing before reuse.

Eye contact : Immediately flush eye(s) with plenty of water. After initial flushing, remove any contact lenses if worn, and continue flushing for at least 5 to 10 minutes. If irritation persists, seek prompt medical attention.

Most important symptoms and effects, both acute and delayed

: Harmful if swallowed. May cause damage to the kidneys if swallowed. May cause drowsiness or dizziness. Symptoms may include pain, headache, nausea, vomiting, dizziness, drowsiness and other central nervous system effects. May cause slight eye and skin irritation. Symptoms include: Redness, swelling, itching and dryness. Suspected of damaging the unborn child.

Indication of any immediate medical attention and special treatment needed

: Immediate medical attention is required. May be harmful or fatal if swallowed. Use of ethanol may be helpful to counter the toxic effects of ethylene glycol by interfering with the absorption rate in the stomach and intestine. Onset of symptoms may be delayed for 18 to 24 hours after ingestion. Symptoms may be delayed.

SAFETY DATA SHEET

SECTION 5. FIRE-FIGHTING MEASURES

Extinguishing media

Suitable extinguishing media

: Use media suitable to the surrounding fire such as water fog or fine spray, alcohol foams, carbon dioxide and dry chemical.

Unsuitable extinguishing media

: Do not use a solid water stream as it may scatter and spread fire.

Special hazards arising from the substance or mixture / Conditions of flammability

: Burning produces obnoxious and toxic fumes.

Flammability classification (OSHA 29 CFR 1910.106)

: Not flammable.

Hazardous combustion products

: Carbon oxides, formaldehyde and other irritating fumes and smoke.

Special protective equipment and precautions for firefighters

Protective equipment for fire-fighters

: Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA.

Special fire-fighting procedures

: Firefighters should wear proper protective equipment and self-contained breathing apparatus with full face piece operated in positive pressure mode. Move containers from fire area if safe to do so. Water spray may be useful in cooling equipment exposed to heat and flame.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

: Restrict access to area until completion of clean-up. Ensure clean-up is conducted by trained personnel only. All persons dealing with clean-up should wear the appropriate protective equipment including self-contained breathing apparatus. Refer to Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION, for additional information on acceptable personal protective equipment.

Environmental precautions : Ensure spilled product does not enter drains, sewers, waterways, or confined spaces. If necessary, dike well ahead of the spill to prevent runoff into drains, sewers, or any natural waterway or drinking supply.

Methods and material for containment and cleaning up

: Ventilate the area. Stop spill or leak at source if safely possible. Dike for water control. Contain and absorb spilled liquid with non-combustible, inert absorbent material (e.g. sand), then place absorbent material into a container for later disposal (see Section 13).

Special spill response procedures

: If a spill/release in excess of the EPA reportable quantity is made into the environment, immediately notify the national response center in the United States (phone: 1-800-424-8802).
US CERCLA Reportable quantity (RQ): Ethylene glycol (5000 lbs / 2270 kg).

SECTION 7. HANDLING AND STORAGE

Precautions for safe handling

SAFETY DATA SHEET

: Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. This material is a harmful liquid. Wear protective gloves/clothing and eye/face protection. Refer to Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION, for additional information on acceptable personal protective equipment. Use with adequate ventilation. Do not ingest. Do not breathe mist or vapor. Avoid contact with eyes, skin and clothing. Wash with soap and water after handling. Keep away from extreme heat and flame. Keep away from acids and other incompatibles. Use caution when opening cap. Keep containers tightly closed when not in use. Empty containers retain residue (liquid and/or vapour) and can be dangerous.

Conditions for safe storage : Store in a cool, dry, well-ventilated area. Store away from areas of excessive heat, open flames, sparks, and other possible sources of ignition. Keep away from incompatibles. Storage area should be clearly identified, clear of obstruction and accessible only to trained and authorized personnel. Inspect periodically for damage or leaks.

Incompatible materials : Alkalies ;Strong oxidizing agents;Strong acids.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Limits:

Chemical Name	ACGIH TLV		OSHA PEL	
	TWA	STEL	PEL	STEL
Ethylene glycol	100 mg/m³ (aerosol) (Ceiling)	N/Av	50 ppm (final rule limit)	N/Av

Exposure controls

Ventilation and engineering measures

: Use sufficient mechanical ventilation to maintain exposures below the TLV. Use local exhaust if mist or spray is generated.

Respiratory protection : Respiratory protection is required if the concentrations exceed the TLV. NIOSH-approved respirators are recommended. Seek advice from respiratory protection specialists. Respirators should be selected based on the form and concentration of contaminants in air, and in accordance with OSHA (29 CFR 1910.134) or CSA Z94.4-02.

Skin protection : Wear impervious gloves, such as butyl rubber. Advice should be sought from glove suppliers.

Eye / face protection : Chemical goggles are recommended when there is a potential for splashing.

Other protective equipment : Emergency showers and eyewash facilities should be nearby. Wear a chemically resistant apron and long sleeves when dispensing, to prevent skin contact.

General hygiene considerations

: Do not breathe mist or vapor. Avoid contact with eyes, skin and clothing. When using do not eat or drink. When using do not smoke. Upon completion of work, wash hands before eating, drinking, smoking or use of toilet facilities. Remove soiled clothing and wash it thoroughly before reuse.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance : Clear, colourless liquid.

Odour : Little or no odour.

Odour threshold : N/Av

pH : N/Av

Melting/Freezing point : - 13°C (8.6°F)

Initial boiling point and boiling range

: 198°C (388°F)

SAFETY DATA SHEET

Flash point	:	111°C (232°F)
Flashpoint (Method)	:	closed cup
Evaporation rate (BuAe = 1)	:	N/Av
Flammability (solid, gas)	:	Not applicable.
Lower flammable limit (% by vol.)	:	3.2%
Upper flammable limit (% by vol.)	:	15.0%
Oxidizing properties	:	None known.
Explosive properties	:	Not explosive
Vapour pressure	:	0.05
Vapour density	:	2.1
Relative density / Specific gravity	:	1.12
Solubility in water	:	Complete
Other solubility(ies)	:	Soluble in most organic solvents.
Partition coefficient: n-octanol/water or Coefficient of water/oil distribution	:	-1.36
Auto-ignition temperature	:	398°C (748°F)
Decomposition temperature	:	Not available.
Viscosity	:	21 cp @ 20°C (68°F)
Volatiles (% by weight)	:	No information available.
Volatile organic Compounds (VOC's)	:	N/Av
Absolute pressure of container	:	N/Ap
Flame projection length	:	N/Ap
Other physical/chemical comments	:	Molecular Weight: :: 62.07 Molecular formula: C2-H6-O2

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	Not normally reactive.
Chemical stability	:	Stable under normal conditions.
Possibility of hazardous reactions	:	No dangerous reaction known under conditions of normal use.
Conditions to avoid	:	Avoid excessive heat, sparks and open flame. Do not use in areas without adequate ventilation. Avoid contact with incompatible materials.
Incompatible materials	:	Alkalies ;Strong oxidizing agents;Strong acids.
Hazardous decomposition products	:	None known, refer to hazardous combustion products in Section 5.

SECTION 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure:

Routes of entry inhalation	:	YES
Routes of entry skin & eye	:	YES
Routes of entry Ingestion	:	YES
Routes of exposure skin absorption	:	YES

SAFETY DATA SHEET

Potential Health Effects:

Signs and symptoms of short-term (acute) exposure

Sign and symptoms Inhalation

: If mists are inhaled, may cause tearing, general anesthesia, headache, coughing, respiratory stimulation, nausea, vomiting, pulmonary, kidney and liver damage.

Sign and symptoms ingestion

: Harmful or fatal if swallowed. Human poison by ingestion (lethal dose of Ethylene glycol for humans reported to be 100 mL). Symptoms may include pain, headache, nausea, vomiting, dizziness, drowsiness and other central nervous system effects. Initially, the central nervous system is stimulated, followed by depression. Could cause cyanosis (bluish discoloration of the skin due to deficient oxygenation of the blood). May potentially result in lethal kidney damage. Could also cause convulsions, coma, respiratory arrest and death.

Sign and symptoms skin : May cause mild skin irritation. Product may be absorbed and cause symptoms similar to those listed for ingestion.

Sign and symptoms eyes : May cause mild eye irritation. Symptoms may include inflammation and tearing.

Potential Chronic Health Effects

: Prolonged or repeated ingestion may cause bladder or kidney stones.

Mutagenicity : Not expected to be mutagenic.

Carcinogenicity : No components are listed as carcinogens by ACGIH, IARC, OSHA or NTP.

Reproductive effects & Teratogenicity

: This material is classified as hazardous under U.S. OSHA regulations (29CFR 1910.1200) (Hazcom 2012) and Canadian WHMIS regulations (Hazardous Products Regulations) (WHMIS 2015). Classification:
Reproductive toxicity -Category 2
Suspected of damaging the unborn child.

Sensitization to material : Not expected to be a skin or respiratory sensitizer.

Specific target organ effects : Eyes, skin, respiratory system, central nervous system, liver and kidneys.
This material is classified as hazardous under U.S. OSHA regulations (29CFR 1910.1200) (Hazcom 2012) and Canadian WHMIS regulations (Hazardous Products Regulations) (WHMIS 2015). Classification:
Specific target organ toxicity, single exposure-Category 2
Specific Target Organ Toxicity, Single Exposure - Category 3 (cns)
May cause damage to the kidneys if swallowed.
May cause drowsiness or dizziness.

Not classified as a specific target organ toxicity-repeated exposure.

Medical conditions aggravated by overexposure

: Pre-existing skin or eye disorders, and impaired liver or kidney functions.

Synergistic materials : Not available.

Toxicological data : See below for toxicological data on the substance.

Chemical name	LC_{50}(4hr) inh, rat	LD_{50} (Oral, rat)	LD_{50} (Rabbit, dermal)
Ethylene glycol	4300 ppm (10.92 mg/L) (aerosol)	4000 mg/kg (rat) The estimated human lethal dose is: 1110 - 1665 mg/kg	9530 mg/kg

Other important toxicological hazards

: CNS depression may result from extreme exposures.

SAFETY DATA SHEET

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity : See the following tables for individual ingredient ecotoxicity data.

Ecotoxicity data:

Ingredients	CAS No	Toxicity to Fish		
		LC50 / 96h	NOEC / 21 day	M Factor
Ethylene glycol	107-21-1	22 810 mg/L (Rainbow trout	N/Av	None.

Ingredients	CAS No	Toxicity to Daphnia		
		EC50 / 48h	NOEC / 21 day	M Factor
Ethylene glycol	107-21-1	49 000 mg/L (Daphnia magna)	7500 - 15 000 mg/L	None.

Ingredients	CAS No	Toxicity to Algae		
		EC50 / 96h or 72h	NOEC / 96h or 72h	M Factor
Ethylene glycol	107-21-1	6500 - 13 000 mg/L/96hr (Green algae)	10 000 mg/L/96hr	None.

Persistence and degradability

: Ethylene glycol is considered to be readily biodegradable.

Bioaccumulation potential : No data is available on the product itself.

Components	Partition coefficent n-octanol/ater (log Kow)	Bioconcentration factor (BCF)
Ethylene glycol (CAS 107-21-1)	- 1.36	10

Mobility in soil : No data is available on the product itself.

Other Adverse Environmental effects

: No data is available on the product itself.

SECTION 13. DISPOSAL CONSIDERATIONS

Handling for Disposal : Handle waste according to recommendations in Section 7.

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Methods of Disposal : Dispose in accordance with all applicable federal, state, provincial and local regulations. Contact your local, state, provincial or federal environmental agency for specific rules.

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RCRA : If this product, as supplied, becomes a waste in the United States, it may meet the criteria of a hazardous waste as defined under RCRA, Title 40 CFR 261. It is the responsibility of the waste generator to determine the proper waste identification and disposal method. For disposal of unused or waste material, check with local, state and federal environmental agencies.

SECTION 14. TRANSPORTATION INFORMATION

SAFETY DATA SHEET

Regulatory Information	UN Number	UN proper shipping name	Transport hazard class(es)	Packing Group	Label
49CFR/DOT	None	Not regulated.	Not regulated	none	
49CFR/DOT Additional information	If the quantity of Ethylene glycol is greater than 5000 pounds per container, the following DOT shipping description applies: RQ UN3082, Environmentally hazardous substances, liquid, n.o.s. (Ethylene glycol), 9, III.				
TDG	None	Not regulated.	Not regulated	none	
TDG Additional information	None.				

Special precautions for user : None known or reported by the manufacturer.

Environmental hazards : See ECOLOGICAL INFORMATION, Section 12.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

: Not available.

SECTION 15 - REGULATORY INFORMATION

US Federal Information:

Components listed below are present on the following U.S. Federal chemical lists:

Ingredients	CAS #	TSCA Inventory	CERCLA Reportable Quantity(RQ) (40 CFR 117.302):	SARA TITLE III: Sec. 302, Extremely Hazardous Substance, 40 CFR 355:	SARA TITLE III: Sec. 313, 40 CFR 372, Specific Toxic Chemical	
					Toxic Chemical	de minimus Concentration
Ethylene glycol	107-21-1	Yes	5000 lb/ 2270 kg	None.	Yes	1%

SARA TITLE III: Sec. 311 and 312, SDS Requirements, 40 CFR 370 Hazard Classes: Immediate (Acute) health hazard; Chronic health hazard. Under SARA Sections 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are 500 pounds for the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

US State Right to Know Laws:

The following chemicals are specifically listed by individual States:

Ingredients	CAS #	California Proposition 65		State "Right to Know" Lists					
		Listed	Type of Toxicity	CA	MA	MN	NJ	PA	RI
Ethylene glycol	107-21-1	No	N/Ap	Yes	Yes	Yes	Yes	Yes	Yes

Canadian Information:

WHMIS Classification: Refer to Section 2 for a WHMIS Classification for this product.
All ingredients are present on the DSL.

SAFETY DATA SHEET

International Information:

Components listed below are present on the following International Inventory list:

Ingredients	CAS #	European EINECs	Australia AICS	Philippines PICCS	Japan ENCS	Korea KECI/KECL	China IECSC	NewZealand IOC
Ethylene glycol	107-21-1	203-473-3	Present	Present	(2)-230	KE-13169	Present	HSR001534

SECTION 16. OTHER INFORMATION

Legend : ACGIH: American Conference of Governmental Industrial Hygienists
CA: California
CAS: Chemical Abstract Services
CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR: Code of Federal Regulations
CNS: Central Nervous System
COC: Cleveland Open Cup
CSA: Canadian Standards Association
DOT: Department of Transportation
EPA: Environmental Protection Agency
HMIS: Hazardous Materials Identification System
HSDB: Hazardous Substances Data Bank
IARC: International Agency for Research on Cancer
Inh: Inhalation
LC: Lethal Concentration
LD: Lethal Dose
MA: Massachusetts
MN: Minnesota
N/Ap: Not Applicable
N/Av: Not Available
NFPA: National Fire Protection Association
NIOSH: National Institute of Occupational Safety and Health
NJ: New Jersey
NTP: National Toxicology Program
OSHA: Occupational Safety and Health Administration
PA: Pennsylvania
PEL: Permissible exposure limit
RCRA: Resource Conservation and Recovery Act
RI: Rhode Island
RTECS: Registry of Toxic Effects of Chemical Substances
SARA: Superfund Amendments and Reauthorization Act
STEL: Short Term Exposure Limit
TLV: Threshold Limit Values
TWA: Time Weighted Average
WHMIS: Workplace Hazardous Materials Identification System

References : Canadian Centre for Occupational Health and Safety, CCInfoWeb Databases, 2015 (Chempendium, RTECs, HSDB, INCHEM).
European Chemicals Agency, Classification Legislation, 2015
Material Safety Data Sheet from manufacturer.
OECD- The Global Portal to Information on Chemical Substances - eChemPortal, 2015

Preparation Date (mm/dd/yyyy)

: 08/20/2015

Other special considerations for handling

: Provide adequate information, instruction and training for operators.

SAFETY DATA SHEET

HMIS Rating : *- Chronic hazard 0 - Minimal 1 - Slight 2 - Moderate 3 - Serious 4 - Severe

Health: *2 *Flammability:* 1 *Reactivity:* 0

NFPA Rating 0 - Minimal 1 - Slight 2 - Moderate 3 - Serious 4 - Severe

: *Health:* 2 *Flammability:* 1 *Instability:* 0 *Special Hazards:* None

Prepared for: Comet Chemical Company Ltd. 3463 Thomas Street Innisfill, ON L9S 3W4 Information (M-F 8:00-5:00): 705-436-5580 www.cometchemical.com	
Prepared by: ICC The Compliance Center Inc. Telephone: (888) 442-9628 (U.S.): (888) 977-4834 (Canada) http://www.thecompliancecenter.com	

DISCLAIMER

This Safety Data Sheet was prepared by ICC The Compliance Center Inc using information provided by / obtained from Comet Chemical Company Ltd.. and CCOHS' Web Information Service. The information in the Safety Data Sheet is offered for your consideration and guidance when exposed to this product. ICC The Compliance Center Inc and Comet Chemical Company Ltd. expressly disclaim all expressed or implied warranties and assume no responsibilities for the accuracy or completeness of the data contained herein. The data in this SDS does not apply to use with any other product or in any other process.

This Safety Data Sheet may not be changed, or altered in any way without the expressed knowledge and permission of ICC The Compliance Center Inc and Comet Chemical Company Ltd.

END OF DOCUMENT

MATERIAL SAFETY DATA SHEET

1. Product and Company Identification

Material name	**SOLVENT**
Revision date	09-16-2011
Version #	01
CAS #	8052-41-3
Product code	2183
Product use	Solvent. Fuel. Diluter Feedstock.
Synonym(s)	VARSOL 3139 SOLVENT
Manufacturer	Univar Canada Ltd.
Address	9800 Van Home Way Richmond, BC V6X 1W5 Canada
Telephone	-
Supplier	Federated Co-operative Limited
Address	P.O. Box 1050, 401 - 22nd Street East Saskatoon SK S7K 3M9 Canada
Telephone	(306) 244-3447
24 Hour Emergency Telephone	(613) 996-6666 - Canutec

2. Hazards Identification

Physical state	Liquid.
Appearance	Clear liquid.
Emergency overview	WARNING! Combustible liquid and vapor. Harmful if swallowed - may enter lungs if swallowed or vomited. May cause skin irritation. May cause central nervous system effects. May cause damage to the kidneys.
OSHA regulatory status	This product is hazardous according to OSHA 29 CFR 1910.1200.
Potential health effects	
Routes of exposure	Inhalation. Skin contact. Ingestion.
Eyes	Direct contact with eyes may cause temporary irritation.
Skin	Prolonged or repeated contact may dry skin and cause irritation.
Inhalation	Overexposure to mists/vapours of this product may cause headache, dizziness, nausea, and respiratory tract irritation.
Ingestion	Swallowing or vomiting of the liquid may result in aspiration into the lungs.
Chronic effects	Exposure over a long period of time may cause central nervous system effects. Symptoms may be delayed.
Signs and symptoms	Overexposure to mists/vapours of this product may cause headache, dizziness, nausea, and respiratory tract irritation. Prolonged or repeated contact may dry skin and cause irritation. Droplets of the product aspirated into the lungs through ingestion or vomiting may cause a serious chemical pneumonia.
Potential environmental effects	Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

3. Composition / Information on Ingredients

Components	CAS #	Percent
Stoddart solvent	8052-41-3	60-100

Composition comments All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First Aid Measures

First aid procedures

Eye contact Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 20 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

Skin contact	Wash area with soap and water. Get medical attention if irritation develops or persists.
Inhalation	If symptomatic, move to fresh air. Get medical attention if symptoms persist.
Ingestion	Call a physician or poison control center immediately. DO NOT induce vomiting. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person. If vomiting occurs, keep head lower than the hips to help prevent aspiration. Never give anything by mouth to an unconscious person.
Notes to physician	Treat symptomatically.

5. Fire Fighting Measures

Flammable properties	Combustible liquid and vapor. Material will float and may ignite on surface of water. Containers may explode when heated.
Extinguishing media	
Suitable extinguishing media	Carbon dioxide (CO2). Foam. Dry chemical. Water fog.
Unsuitable extinguishing media	None known.
Fire fighting equipment/instructions	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Specific methods	Cool containers exposed to heat with water spray and remove container, if no risk is involved.
Hazardous combustion products	Carbon oxides.

6. Accidental Release Measures

Personal precautions	Ensure adequate ventilation. Wear suitable protective clothing. See Section 8 of the MSDS for Personal Protective Equipment.
Environmental precautions	Collect and dispose of spillage as indicated in Section 13 of the MSDS.
Methods for containment	Eliminate all ignition sources. Dike the spilled material, where this is possible. Prevent entry into waterways, sewer, basements or confined areas.
Methods for cleaning up	Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Never return spills to original containers for re-use. Following product recovery, flush area with water. Clean surface thoroughly to remove residual contamination.
Other information	Absorb spill with vermiculite or other inert material, then place in a container for chemical waste.

7. Handling and Storage

Handling	Use only with adequate ventilation. Wash thoroughly after handling. Observe good industrial hygiene practices.
Storage	Keep container tightly closed and in a well-ventilated place. Store in closed original container at room temperature. Store away from incompatible materials.

8. Exposure Controls / Personal Protection

Occupational exposure limits

US. ACGIH Threshold Limit Values

Material	Type	Value
Stoddart solvent (8052-41-3)	TWA	100 ppm

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Material	Type	Value
Stoddart solvent (8052-41-3)	PEL	2900 mg/m3
		500 ppm

Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2)

Material	Type	Value
Stoddart solvent (8052-41-3)	TWA	100 ppm

Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2)

Material	Type	Value
		572 mg/m3

Canada. British Columbia OELs. (Occupational Exposure Limits for Chemical Substances, Occupational Health and Safety Regulation 296/97, as amended)

Material	Type	Value
Stoddart solvent (8052-41-3)	TWA	290 mg/m3
	STEL	580 mg/m3

Canada. Ontario OELs. (Ministry of Labor - Control of Exposure to Biological or Chemical Agents)

Material	Type	Value
Stoddart solvent (8052-41-3)	TWA	525 mg/m3

Canada. Quebec OELS. (Ministry of Labor - Regulation Respecting the Quality of the Work Environment)

Material	Type	Value
Stoddart solvent (8052-41-3)	TWA	100 ppm
		525 mg/m3

Mexico. Occupational Exposure Limit Values

Material	Type	Value
Stoddart solvent (8052-41-3)	TWA	100 ppm
	STEL	1050 mg/m3
		200 ppm
	TWA	523 mg/m3

Engineering controls Provide adequate ventilation. Observe Occupational Exposure Limits and minimize the risk of inhalation of vapors.

Personal protective equipment

Eye / face protection Use approved safety goggles or face shield.

Skin protection Wear appropriate chemical resistant clothing to prevent any possibility of skin contact.

Respiratory protection In case of inadequate ventilation, use respiratory protection.

General hygiene considerations Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical & Chemical Properties

Appearance	Clear liquid.
Color	Clear, colorless.
Odor	Mild. Petroleum.
Odor threshold	Not available.
Physical state	Liquid.
Form	Liquid.
pH	Not applicable.
Melting point	-72.4 °F (-58 °C)
Freezing point	Not available.
Boiling point	316.4 - 383 °F (158 - 195 °C)
Flash point	109.4 °F (43 °C) Closed Cup
Evaporation rate	0.1 (Butyl acetate = 1)
Flammability limits in air, upper, % by volume	13.3 %
Flammability limits in air, lower, % by volume	1 %
Vapor pressure	0.04 kPa
Vapor density	5
Specific gravity	0.79 (15.5°C)

Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	444.2 °F (229 °C)
Decomposition temperature	Not available.
VOC	100 %

10. Chemical Stability & Reactivity Information

Chemical stability	Material is stable under normal conditions.
Conditions to avoid	Heat, sparks, flames. Contact with incompatible materials.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	No hazardous decomposition products are known.
Possibility of hazardous reactions	Will not occur.

11. Toxicological Information

Acute effects	Harmful if swallowed - may enter lungs if swallowed or vomited. Prolonged or repeated contact may dry skin and cause irritation. Overexposure to mists/vapours of this product may cause headache, dizziness, nausea, and respiratory tract irritation.
Sensitization	None known.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

IARC Monographs. Overall Evaluation of Carcinogenicity

Stoddart solvent (CAS 8052-41-3)	3 Not classifiable as to carcinogenicity to humans.

12. Ecological Information

Ecotoxicity	Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Persistence and degradability	No data available.
Bioaccumulation / Accumulation	No data available.
Partition coefficient (n-octanol/water)	Not available.
Mobility in environmental media	No data available.

13. Disposal Considerations

Waste codes	D001: Waste Flammable material with a flash point <140 °F
Disposal instructions	Must be incinerated in a suitable incineration plant holding a permit delivered by the competent authorities. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. When this product as supplied is to be discarded as waste, it may meet the definition of a RCRA waste under 40 CFR 261.
Waste from residues / unused products	Dispose of waste and residues in accordance with local authority requirements.
Contaminated packaging	Since emptied containers retain product residue, follow label warnings even after container is emptied.

14. Transport Information

Product Specific Note:	This product meets the limited quantities exception as follows: IMDG: Limited quantities up to 5 liters. Otherwise, the above descriptions apply.

DOT

Basic shipping requirements:

UN number	UN1268
Proper shipping name	Petroleum distillates, n.o.s. or Petroleum products, n.o.s. (Solvant Stoddard)
Hazard class	3
Packing group	III

Labels required	3
Additional information:	
Special provisions	144, B1, IB3, T4, TP1, TP29
Packaging exceptions	150
Packaging non bulk	203
Packaging bulk	242
ERG number	128

IATA

Basic shipping requirements:	
UN number	UN1268
Proper shipping name	Petroleum distillates, n.o.s. or Petroleum products, n.o.s. (Solvant Stoddard)
Hazard class	3
Packing group	III
Labels required	3
Additional information:	
Packaging exceptions	150
Packaging non bulk	203
Packaging bulk	242

IMDG

Basic shipping requirements:	
UN number	1268
Proper shipping name	PETROLEUM DISTILLATES, N.O.S. or PETROLEUM PRODUCTS, N.O.S. (Solvant Stoddard)
Hazard class	3
Packing group	III
EmS No.	F-E, S-E

TDG

Basic shipping requirements:	
Proper shipping name	Petroleum distillates, n.o.s. or Petroleum products, n.o.s. (Solvant Stoddard)
Hazard class	3
UN number	UN1268
Packing group	III
Additional information:	
Special provisions	144, B1, IB3, T4, TP1, TP29
Basic shipping requirements:	
Labels required	3
Additional information:	
Packaging exceptions	150
Packaging non bulk	203
Packaging bulk	242

15. Regulatory Information

US federal regulations This product is hazardous according to OSHA 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification(40 CFR 707, Subpt. D)

Not regulated.

CERCLA (Superfund) reportable quantity (lbs) (40 CFR 302.4)

None

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories	Immediate Hazard - Yes Delayed Hazard - No Fire Hazard - Yes Pressure Hazard - No Reactivity Hazard - No
Section 302 extremely hazardous substance (40 CRF 355, Appendix A)	No
Section 311/312 (40 CFR 370)	No

Drug Enforcement Administration (DEA) (21 CFR 1308.11-15)	Not controlled
Canadian regulations	This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.
WHMIS status	Controlled
WHMIS classification	B3 - Flammable/Combustible D2B - Other Toxic Effects-TOXIC

WHMIS labeling

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

State regulations This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

US - California Hazardous Substances (Director's): Listed substance

Stoddart solvent (CAS 8052-41-3) Listed.

US - Massachusetts RTK - Substance: Listed substance

Stoddart solvent (CAS 8052-41-3) Listed.

US - New Jersey RTK - Substances: Listed substance

Stoddart solvent (CAS 8052-41-3) Listed.

US - Pennsylvania RTK - Hazardous Substances: Listed substance

Stoddart solvent (CAS 8052-41-3) Listed.

16. Other Information

HMIS® ratings	Health: 2 Flammability: 2 Physical hazard: 0
NFPA ratings	Health: 1 Flammability: 2 Instability: 0
Disclaimer	The information in the sheet was written based on the best knowledge and experience currently available.
Issue date	09-16-2011

MILL PROCESS CHEMICALS

MATERIAL SAFETY DATA SHEET

Common Name	**COPPER SULFATE**
Manufacturer	Old Bridge Chemicals, Inc.
	P.O. Box 194
	Old Bridge, New Jersey 08857
Telephone	(732) 727-2225
Emergency Telephone	1(800) 275-3924

This document is prepared pursuant to the OSHA Hazard Communication Standard (29 CFR 1910.1200).

SECTION I. MATERIAL IDENTIFICATION

Common Name	Copper Sulfate
Synonyms	Blue Vitrol, Bluestone, Cupric Sulfate
Molecular Formula	$CuSO_4 \bullet 5H_20$
EPA Reg. Number	46923-4
CAS Number	7758-99-8
SIC Number	28199 C 29

SECTION II. PHYSICAL DATA

Physical State	Blue crystals or powder
Boiling Point	-5 H_2O @ 150° F
Melting Point	-4 H_2O @ 110° F
Specific Gravity	2.284
Solubility in H_2O	22.37% @ 0° C
	117.95% @ 100° C
Solubility in other solvents	Soluble in methanol, glycerol and slightly soluble in ethanol
Appearance	Blue crystals or powder
Odor	Odorless

SECTION III. FIRE AND EXPLOSION DATA

Flash Point	Not applicable
Flammable Limits	Not flammable. If heated above 400° C it can decompose to emit toxic fumes of oxide and sulfur.
Extinguishing Media	Copper Sulfate does not burn nor will it support combustion. If stored with other combustible products use water, CO_2 or dry chemical.
Special Fire Fighting Instructions	If dry heated above 600° C, SO_2 is evolved. If water is used it will solubalize the Copper Sulfate and care should be taken to keep such water out of streams or other water bodies.
Fire and Explosion Hazards	None

SECTION IV. REACTIVITY DATA

Stability	Stable
Conditions to Avoid	Product is highly soluble, but does not react with water.
Incompatibility	None know when product remains dry. Product readily dissolves in water. Solutions are mildly corrosive to steel. Store solutions in plastic or rubber or 304, 347 or 316 stainless steel. Iron and moisture should be avoided. Store in a dry area. With exposure to air it will oxidize and turn whitish.
Hazardous Decomposition Products	None at normal production temperatures and pressures. If dry heated above 600° C toxic sulfur may evolve.
Polymerization	Will not occur.

SECTION V. HEALTH AND HAZARD INFORMATION

Swallowing	Toxic orally in accordance with FHSLA regulations. Acute oral LD50 (male rats) = 472 mg/kg.
Skin	Non-toxic. Skin irritation index is zero in accordance with FHSLA regulations.
Eyes	Corrosive in accordance with FHSLA regulations. Eye irritation score: 24 hours = 41.67; 48 hours = corrosive
Inhalation	Inhalation of dust may cause irritation to the upper respiration tract.
Carcinogenicity	None as per NTP, OSHA, and IARC.

This product contains Copper Sulfate subject to the reporting requirements of Section 13 of the Emergency Planning and Community-right-to-Know-Act of 1986 (40 CFR 372).

SECTION VI. FIRST AID PROCEDURES

Swallowing	Give large amounts of milk or water. Induce vomiting. Call Poison Control Center or a physician.
Skin	Wash thoroughly with soap and water. Remove and wash contaminated clothing before reuse.
Eyes	Immediately flush eyes with plenty of water for 15 minutes. Hold eyelids apart during irrigation. Call a physician.
Inhalation	Remove person to fresh air and call a physician.
Carcinogenicity	None

SECTION VII. HANDLING PRECAUTIONS

Personal Protective Equipment	Chemical safety goggles. Rubber gloves and rubber apron may be worn.
Ventilation	TWA = 1 mg/l for Copper Sulfate. When TWA exceeds this limit in the workplace, provide appropriate ventilation. Wear an approved respirator for dusts or mists: MSHA/NIOSH approved number prefix TC-21C, or a NIOSH approved respirator with any R, P or HE filter.

Alternatively, provide respiratory protection equipment in accordance with Paragraph 1910.134 of Title 29 of the Code of Federal Regulations.

SECTION VIII. ENVIRONMENTAL AND DISPOSAL INFORMATION

Aquatic Toxicity	LC50, 24 hours, Daphnia magna equals 0.182 mg/l. Rainbow Trout equals 0.17 mg/l. Blue Gill equals 1.5 mg/l. All values are expressed as Copper Sulfate Pentahydrate. Test water was soft.
Spills and Leaks	Comply with Federal, State and local regulations on reporting spills. Do not wash away crystals or powder. Recover dry if possible. If product is in a confined solution, react with soda ash to form an insoluble Copper Carbonate solid that can be scooped up.
Waste Disposal	Do not reuse container. Comply with Federal, State and local regulations. Sweep up crystals, powder or insoluble Copper Carbonate and dispose of in an approved landfill.
Environmental Effects	May be dangerous if it enters the public water systems. Follow local regulation. Toxic to fish and plants. Fish toxicity critical concentration is 235 mg/l and plant toxicity is 25 mg/l.

SECTION IX. SPECIAL PRECAUTIONS

Storage	Store in a dry place.
Other Precautions	None other than those stated in the MSDS or on the package.

SECTION XI. REGULATORY INFORMATION

NOTICE: The information herein is presented in good faith and believed to be accurate. However, no warranty, expressed or implied, is given. Regulatory requirements are subject to change and may differ from one location to another. It is the buyer's responsibility to ensure that its activities comply with Federal, State and local laws.

U.S. REGULATIONS: SARA 313 Information. This product contain the following substance subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372: **COPPER COMPOUND** 63.3%.

SARA HAZARD CATEGORY: This product has been reviewed according to the EPA "Hazard Categories" promulgated under Sections 311 and 312 of the Superfund Amendments and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following category: **AN IMMEDIATE HEALTH HAZARD.**

SECTION XII. SHIPPING INFORMATION

DOT Shipping Name: RQ, Environmentally Hazardous Substance, Solid, N.O.S., (CUPRIC SULFATE), 9, UN3077, PGIII, Marine Pollutant, ERG 171.

SECTION XIII. MSDS PREPARATION INFORMATION

Prepared by	Joel L. Goldschmidt, Vice President
Updated	March 16, 1999

PREPARATION INFORMATION / RENSEIGNEMENTS SUR LA PRÉPARATION:
Prepared for use in Canada by: / Pour utilisation au Canada, préparé par:
EH&S Product Regulatory Management Department
Dow Chemical Canada Inc. P.O. Box 1012, Sarnia, Ontario N7T 7K7 (800) 363-3500 EXT.2241

M A T E R I A L S A F E T Y D A T A S H E E T

1. CHEMICAL PRODUCT & COMPANY IDENTIFICATION

IN CASE OF EMERGENCY: Fort Saskatchewan, Alberta: (780) 998-8282
Sarnia, Ontario: (519) 339-3711
Varennes, Quebec: (450) 652-1000

Product: DOWFROTH* 250 FLOTATION FROTHER

Product Code: 23586

Effective Date: 01/15/99 Date Printed: 07/17/00 MSD: 002010

Dow Chemical Canada Inc.
P.O. Box 1012, Sarnia, Ontario N7T 7K7

Prepared for use in Canada by the EH&S Product Regulatory Management Department; Phone: (800) 363-3500 EXT. 2241

2. COMPOSITION/INFORMATION ON INGREDIENTS

Propylene oxide methanol adduct	CAS# 037286-64-9	99%
Potassium hydroxide	CAS# 001310-58-3	1%

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

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* *
* Yellow to dark brown liquid. Low odor. Causes eye burns. *
* *
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POTENTIAL HEALTH EFFECTS (See Section 11 for toxicological data.)

(Continued on page 2)

EYE: Due to the pH of the material, it is assumed that exposure may cause severe irritation with corneal injury which may result in permanent impairment of vision, even blindness.

SKIN: Short single exposure not likely to cause significant skin irritation. Prolonged or repeated exposure may cause moderate skin irritation. May cause more severe response if confined to skin or skin is abraded (scratched or cut). Prolonged or repeated exposure to very large amounts of component(s) in this mixture may cause narcosis (drowsiness).

INGESTION: Single dose oral toxicity is considered to be low. Small amounts swallowed incidental to normal handling operations are not likely to cause injury; swallowing amounts larger than that may cause injury. Observations in animals include tremors and convulsions.

INHALATION: At room temperature, vapors are minimal due to physical properties; a single exposure is not likely to be hazardous. If material is heated or mist is produced, concentrations may be attained that are sufficient to cause respiratory irritation and other effects. Signs and symptoms of excessive exposure may be anesthetic or narcotic effects.

SYSTEMIC (OTHER TARGET ORGAN) EFFECTS: Signs and symptoms of excessive exposure may be anesthetic or narcotic effects.

TERATOLOGY (BIRTH DEFECTS): Contains component(s) which did not cause birth defects in laboratory animals.

4. FIRST AID

(Continued on page 3)

EYE: Wash eyes immediately and continuously for 30 minutes. Seek medical attention immediately. Wash eyes enroute if possible.

SKIN: Wash off in flowing water or shower.

INGESTION: If swallowed, seek medical attention. Do not induce vomiting unless directed to do so by medical personnel.

INHALATION: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, oxygen should be administered by qualified personnel. Call a physician or transport to a medical facility.

NOTE TO PHYSICIAN: Eye irrigation may be necessary for an extended period of time to remove as much caustic as possible. Duration of irrigation and treatment is at the discretion of medical personnel. No specific antidote. Supportive care. Treatment based on judgment of the physician in response to reactions of the patient.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES
FLASH POINT: 300F, 149C
METHOD USED: Setaflash
AUTOIGNITION TEMPERATURE: Not determined.

FLAMMABILITY LIMITS
LFL: Not determined.
UFL: Not determined.

(Continued on page 4)

HAZARDOUS COMBUSTION PRODUCTS: Under fire conditions polymers decompose. The smoke may contain polymer fragments of varying compositions in addition to unidentified toxic and/or irritating compounds. Hazardous combustion products may include and are not limited to: carbon monoxide and carbon dioxide.

OTHER FLAMMABILITY INFORMATION: Violent steam generation or eruption may occur upon application of direct water stream to hot liquids. Spills of these organic liquids on hot fibrous insulations may lead to lowering of the autoignition temperatures possibly resulting in spontaneous combustion.

EXTINGUISHING MEDIA: Water fog or fine spray, carbon dioxide, dry chemical, foam. Alcohol resistant foams (ATC type) are preferred if available. General purpose synthetic foams (including AFFF) or protein foams may function, but much less effectively. Do not use direct water stream. Will spread fire.

MEDIA TO BE AVOIDED: Do not use direct water stream.

FIRE FIGHTING INSTRUCTIONS: Keep people away. Isolate fire area and deny unnecessary entry. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage. Burning liquids may be extinguished by dilution with water. Do not use direct water stream. May spread fire.

PROTECTIVE EQUIPMENT FOR FIRE FIGHTERS: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, pants, boots, and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.

6. ACCIDENTAL RELEASE MEASURES (See Section 15 for Regulatory Information)

(Continued on page 5)

PROTECT PEOPLE: Clear non-emergency personnel from area.

PROTECT THE ENVIRONMENT: Contain liquid to prevent contamination of soil, surface water or ground water.

CLEANUP: Soak up with suitable, non-reactive absorbent material. Collect into suitable containers for disposal.

7. HANDLING AND STORAGE

HANDLING: Avoid contact with vapors from head space of containers.

STORAGE: To avoid uncontrolled emissions vent vapor from container to storage tank.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: Provide general and/or local exhaust ventilation to control airborne levels below the exposure guideline.

PERSONAL PROTECTIVE EQUIPMENT

EYE/FACE PROTECTION: Use chemical goggles. Eye wash fountain should be located in immediate work area.

SKIN PROTECTION: When prolonged or frequently repeated contact could occur, use protective clothing impervious to this material. Selection of specific items such as faceshield,

(Continued on page 6)

gloves, boots, apron, or full-body suit will depend on operation. If hands are cut or scratched, use gloves impervious to this material even for brief exposures.

RESPIRATORY PROTECTION: Atmospheric levels should be maintained below the exposure guideline. For most conditions, no respiratory protection should be needed; however, if material is heated or sprayed, use an approved air-purifying respirator.

EXPOSURE GUIDELINE(S): Dipropylene glycol methyl ether: ACGIH TLV and OSHA PEL are 100 ppm TWA, 150 ppm STEL.

Potassium hydroxide: ACGIH TLV and OSHA PEL are 2 mg/m3 Ceiling.

PELs are in accord with those recommended by OSHA, as in the 1989 revision of PELs.

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Yellow to dark brown liquid.
ODOR: Not available.
VAPOR PRESSURE: <0.01 mmHg @ 20C
VAPOR DENSITY: Low
BOILING POINT: 473F, 245C
SOLUBILITY IN WATER: Completely miscible.
SPECIFIC GRAVITY: 0.98 25/25

10. STABILITY AND REACTIVITY

CHEMICAL STABILITY: Stable under recommended storage conditions. See Storage Section.

(Continued on page 7)

CONDITIONS TO AVOID: None known.

INCOMPATIBILITY WITH OTHER MATERIALS: Avoid contact with oxidizing materials.

HAZARDOUS DECOMPOSITION PRODUCTS: None known.

HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL INFORMATION (See Section 3 for Potential Health Effects. For detailed toxicological data, write or call the address or non-emergency number shown in Section 1)

SKIN: The dermal LD50 has not been determined.

INGESTION: The oral LD50 for rats is between 1260 - 2520 mg/kg.

MUTAGENICITY: In vitro mutagenicity studies were negative for component(s) tested.

12. ECOLOGICAL INFORMATION (For detailed Ecological data, write or call the address or non-emergency number shown in Section 1)

ENVIRONMENTAL FATE

MOVEMENT & PARTITIONING: Log octanol/water partition coefficient (log Pow) is estimated to be low. Based largely or completely on information for similar material.

DEGRADATION & PERSISTENCE: 20-Day biochemical oxygen demand

(Continued on page 8)

(BOD20) is 0.18 p/p. Biodegradation under aerobic static laboratory conditions is low (BOD20 or BOD28/ThOD between 2.5 and 10%)

ECOTOXICITY: Acute LC50 for fathead minnow (Pimephales promelas) is > 100 mg/L. Material is practically non-toxic to fish on an acute basis (LC50 greater than 100 mg/L).

13. DISPOSAL CONSIDERATIONS (See Section 15 for Regulatory Information)

DISPOSAL: DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal methods must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. THE DOW CHEMICAL COMPANY HAS NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION 2 (Composition/Information On Ingredients).

FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: recycler, reclaimer, incinerator or other thermal destruction device.

As a service to its customers, Dow can provide names of information resources to help identify waste management companies and other facilities which recycle, reprocess or manage chemicals or plastics, and that manage used drums. Telephone Dow's Customer Information Center at 800-258-2436 or 517-832-1556 for further details.

14. TRANSPORT INFORMATION

(Continued on page 9)

DEPARTMENT OF TRANSPORTATION (D.O.T.): For DOT regulatory information, if required, consult transportation regulations, product shipping papers, or your Dow representative.

CANADIAN TDG INFORMATION: For TDG regulatory information, if required, consult transportation regulations, product shipping papers, or your Dow representative.

15. REGULATORY INFORMATION (Not meant to be all-inclusive--selected regulations represented)

NOTICE: The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied is given. Regulatory requirements are subject to change and may differ from one location to another; it is the buyer's responsibility to ensure that its activities comply with federal, state or provincial, and local laws. The following specific information is made for the purpose of complying with numerous federal, state or provincial, and local laws and regulations. See other sections for health and safety information.

CANADIAN REGULATIONS
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WHMIS INFORMATION: The Canadian Workplace Hazardous Materials Information System (WHMIS) Classification for this product is:

E - corrosive to metal or skin
Refer elsewhere in the MSDS for specific warnings and safe handling information. Refer to the employer's workplace education program.

(Continued on page 10)

REGULATORY INFORMATION (CONTINUED)

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CPR STATEMENT: This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

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HAZARDOUS PRODUCTS ACT INFORMATION: This product contains the following ingredients which are Controlled Products and/or on the Ingredient Disclosure List (Canadian HPA section 13 and 14):

COMPONENTS:	CAS #	AMOUNT(%w/w)
Polypropylene glycol methyl ether	CAS# 037286-64-9	98%
Potassium hydroxide	CAS# 001310-58-3	1%

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U.S. REGULATIONS
==========

SARA 313 INFORMATION: To the best of our knowledge, this product contains no chemical subject to SARA Title III Section 313 supplier notification requirements.

SARA HAZARD CATEGORY: This product has been reviewed according to the EPA "Hazard Categories" promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

An immediate health hazard
A delayed health hazard

(Continued on page 11)

REGULATORY INFORMATION (CONTINUED)

TOXIC SUBSTANCES CONTROL ACT (TSCA):

All ingredients are on the TSCA inventory or are not required to be listed on the TSCA inventory.

STATE RIGHT-TO-KNOW: The following product components are cited on certain state lists as mentioned. Non-listed components may be shown in the composition section of the MSDS.

CHEMICAL NAME	CAS NUMBER	LIST
POTASSIUM HYDROXIDE	001310-58-3	NJ1 NJ3 PA1 PA3
DIPROPYLENE GLYCOL METHYL ETHER	034590-94-8	NJ3 PA1

NJ1=New Jersey Special Health Hazard Substance (present at greater than or equal to 0.1%).
NJ3=New Jersey Workplace Hazardous Substance (present at greater than or equal to 1.0%).
PA1=Pennsylvania Hazardous Substance (present at greater than or equal to 1.0%).
PA3=Pennsylvania Environmental Hazardous Substance (present at greater than or equal to 1.0%).

STATE RIGHT-TO-KNOW: This product is not known to contain any

(Continued on page 12)

REGULATORY INFORMATION (CONTINUED)

substances subject to the disclosure requirements of

New Jersey
Pennsylvania

OSHA HAZARD COMMUNICATION STANDARD:

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

16. OTHER INFORMATION

MSDS STATUS: Revised Sections 3, 4, 8, 11, 12, 13, 15.
Canadian regulatory information revised.

Dow AgroSciences

SAFETY DATA SHEET

DOW AGROSCIENCES LLC

Product name: DOWTHERM™ J HEAT TRANSFER FLUID

Issue Date: 10/21/2015
Print Date: 10/22/2015

DOW AGROSCIENCES LLC encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. IDENTIFICATION

Product name: DOWTHERM™ J HEAT TRANSFER FLUID

Recommended use of the chemical and restrictions on use
Identified uses: A heat transfer agent - For industrial use. We recommend that you use this product in a manner consistent with the listed use. If your intended use is not consistent with the stated use, please contact your sales or technical service representative.

COMPANY IDENTIFICATION
DOW AGROSCIENCES LLC
9330 ZIONSVILLE RD
INDIANAPOLIS IN 46268-1053
UNITED STATES

Customer Information Number: 800-992-5994
info@dow.com

EMERGENCY TELEPHONE NUMBER
24-Hour Emergency Contact: 800-992-5994
Local Emergency Contact: 352-323-3500

2. HAZARDS IDENTIFICATION

Hazard classification
This material is hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29CFR 1910.1200.
Flammable liquids - Category 3
Skin irritation - Category 2
Aspiration hazard - Category 1
Acute aquatic toxicity - Category 1
Chronic aquatic toxicity - Category 1

Label elements
Hazard pictograms

Signal word: **DANGER!**

Hazards
Flammable liquid and vapour.
May be fatal if swallowed and enters airways.
Causes skin irritation.
Very toxic to aquatic life with long lasting effects.

Precautionary statements

Prevention
Keep away from heat/sparks/open flames/hot surfaces. No smoking.
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ ventilating/ lighting/ equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Wash skin thoroughly after handling.
Avoid release to the environment.
Wear protective gloves/ eye protection/ face protection.

Response
IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
Do NOT induce vomiting.
If skin irritation occurs: Get medical advice/ attention.
Take off contaminated clothing and wash before reuse.
In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
Collect spillage.

Storage
Store in a well-ventilated place. Keep cool.
Store locked up.

Disposal
Dispose of contents/ container to an approved waste disposal plant.

Other hazards
No data available

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms: diethylbenzene
This product is a substance.

Component	CASRN	Concentration
Diethylbenzene	25340-17-4	> 95.5 %

4. FIRST AID MEASURES

Description of first aid measures
General advice: First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection). If potential for exposure exists refer to Section 8 for specific personal protective equipment.

Inhalation: Move person to fresh air. If not breathing, give artificial respiration; if by mouth to mouth use rescuer protection (pocket mask, etc). If breathing is difficult, oxygen should be administered by qualified personnel. Call a physician or transport to a medical facility.

Skin contact: Wash off with plenty of water. Suitable emergency safety shower facility should be available in work area.

Eye contact: Flush eyes thoroughly with water for several minutes. Remove contact lenses after the initial 1-2 minutes and continue flushing for several additional minutes. If effects occur, consult a physician, preferably an ophthalmologist.

Ingestion: Do not induce vomiting. Call a physician and/or transport to emergency facility immediately.

Most important symptoms and effects, both acute and delayed: Aside from the information found under Description of first aid measures (above) and Indication of immediate medical attention and special treatment needed (below), any additional important symptoms and effects are described in Section 11: Toxicology Information.

Indication of any immediate medical attention and special treatment needed
Notes to physician: Maintain adequate ventilation and oxygenation of the patient. If burn is present, treat as any thermal burn, after decontamination. The decision of whether to induce vomiting or not should be made by a physician. If lavage is performed, suggest endotracheal and/or esophageal control. Danger from lung aspiration must be weighed against toxicity when considering emptying the stomach. No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

5. FIREFIGHTING MEASURES

Suitable extinguishing media: Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. General purpose synthetic foams (including AFFF type) or protein foams are preferred if available. Alcohol resistant foams (ATC type) may function.

Unsuitable extinguishing media: No data available

Special hazards arising from the substance or mixture

Hazardous combustion products: During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating. Combustion products may include and are not limited to: Carbon monoxide. Carbon dioxide.

Unusual Fire and Explosion Hazards: Violent steam generation or eruption may occur upon application of direct water stream to hot liquids. When product is stored in closed containers, a flammable atmosphere can develop. Vapors are heavier than air and may travel a long distance and accumulate in low lying areas. Ignition and/or flash back may occur.

Advice for firefighters
Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry. Stay upwind. Keep out of low areas where gases (fumes) can accumulate. Use water spray to cool fire exposed containers and fire affected zone until fire is out and danger of reignition has passed. Do not use direct water stream. May spread fire. Eliminate ignition sources. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage. Avoid accumulation of water. Product may be carried across water surface spreading fire or contacting an ignition source.

Special protective equipment for firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures: Isolate area. Keep unnecessary and unprotected personnel from entering the area. Refer to section 7, Handling, for additional precautionary measures. Keep personnel out of low areas. Keep upwind of spill. Ventilate area of leak or spill. No smoking in area. Vapor explosion hazard. Keep out of sewers. Eliminate all sources of ignition in vicinity of spill or released vapor to avoid fire or explosion. Ground and bond all containers and handling equipment. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection.

Environmental precautions: Material may float on water and any runoff may create an explosion or fire hazard if ignited. Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

Methods and materials for containment and cleaning up: Contain spilled material if possible. Small spills: Absorb with materials such as: Non-combustible material. Use non-sparking tools in cleanup operations. Pump into suitable and properly labeled containers. Pump with explosion-proof equipment. If available, use foam to smother or suppress. Collect in suitable and properly labeled containers. See Section 13, Disposal Considerations, for additional information.

7. HANDLING AND STORAGE

Precautions for safe handling: Keep away from heat, sparks and flame. Avoid contact with eyes, skin, and clothing. Avoid breathing vapor. Do not swallow. Wash thoroughly after handling. Keep container closed. Use with adequate ventilation. No smoking, open flames or sources of ignition in handling and storage area. Electrically ground and bond all equipment. Use of non-sparking or explosion-proof equipment may be necessary, depending upon the type of operation. Vapors are heavier than air and may travel a long distance and accumulate in low lying areas. Ignition and/or flash back may occur. Containers, even those that have been emptied, can contain vapors. Do not cut, drill,

grind, weld, or perform similar operations on or near empty containers. Spills of these organic materials on hot fibrous insulations may lead to lowering of the autoignition temperatures possibly resulting in spontaneous combustion. This product is a poor conductor of electricity and can become electrostaically charged, even in bonded or grounded equipment. If sufficient charge is accumulated, ignition of flammable mixtures can occur. See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION. Handling operations that can promote accumulation of static charges include but are not limited to mixing, filtering, pumping at high flow rates, splash filling, creating mists or sprays, tank and container filling, tank cleaning, sampling, gauging, switch loading, vacuum truck operations.

Conditions for safe storage: Minimize sources of ignition, such as static build-up, heat, spark or flame.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure limits are listed below, if they exist.

Component	Regulation	Type of listing	Value/Notation
Diethylbenzene	US WEEL	TWA	5 ppm

Exposure controls

Engineering controls: Use engineering controls to maintain airborne level below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, use only with adequate ventilation. Local exhaust ventilation may be necessary for some operations.

Individual protection measures

Eye/face protection: Use safety glasses (with side shields).

Skin protection

Hand protection: Use gloves chemically resistant to this material. Examples of preferred glove barrier materials include: Polyethylene. Ethyl vinyl alcohol laminate ("EVAL"). Polyvinyl alcohol ("PVA"). Polyvinyl chloride ("PVC" or "vinyl"). Styrene/butadiene rubber. Viton. Examples of acceptable glove barrier materials include: Butyl rubber. Chlorinated polyethylene. Natural rubber ("latex"). Neoprene. Nitrile/butadiene rubber ("nitrile" or "NBR"). NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

Other protection: Use protective clothing chemically resistant to this material. Selection of specific items such as face shield, boots, apron, or full body suit will depend on the task.

Respiratory protection: Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, use an approved respirator. Selection of air-purifying or positive-pressure supplied-air will depend on the specific operation and the potential airborne concentration of the material. For emergency conditions, use an approved positive-pressure self-contained breathing apparatus.

The following should be effective types of air-purifying respirators: Organic vapor cartridge.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	
Physical state	Liquid.
Color	Colorless
Odor	Aromatic
Odor Threshold	No test data available
pH	Not applicable
Melting point/range	-81 °C (-114 °F) *Literature*
Freezing point	-81 °C (-114 °F) *Literature*
Boiling point (760 mmHg)	181 °C (358 °F) *Literature*
Flash point	**closed cup** 58 °C (136 °F) *Setaflash Closed Cup ASTM D3828*
Evaporation Rate (Butyl Acetate = 1)	<0.1 *Estimated.*
Flammability (solid, gas)	Not applicable to liquids
Lower explosion limit	0.67 % vol *Literature*
Upper explosion limit	6.03 % vol *Literature*
Vapor Pressure	1 mmHg *Literature*
Relative Vapor Density (air = 1)	4.5 *Literature*
Relative Density (water = 1)	0.865 at 20 °C (68 °F) *Literature*
Water solubility	20 ppm *Literature*
Partition coefficient: n-octanol/water	log Pow: 4.58 *Measured*
Auto-ignition temperature	420 °C (788 °F) *Literature*
Decomposition temperature	No test data available
Kinematic Viscosity	0.98 cSt at 25 °C (77 °F) *Literature*
Explosive properties	No data available
Oxidizing properties	No data available
Molecular weight	134 g/mol *Literature*

NOTE: The physical data presented above are typical values and should not be construed as a specification.

10. STABILITY AND REACTIVITY

Reactivity: No data available

Chemical stability: Stable under recommended storage conditions. See Storage, Section 7.

Possibility of hazardous reactions: Polymerization will not occur.

Conditions to avoid: Exposure to elevated temperatures can cause product to decompose.

Incompatible materials: Avoid contact with oxidizing materials.

Hazardous decomposition products: Decomposition products depend upon temperature, air supply and the presence of other materials. Decomposition products can include and are not limited to: Carbon monoxide. Carbon dioxide.

11. TOXICOLOGICAL INFORMATION

Toxicological information appears in this section when such data is available.

Acute toxicity

Acute oral toxicity
Low toxicity if swallowed. Small amounts swallowed incidentally as a result of normal handling operations are not likely to cause injury; however, swallowing larger amounts may cause injury.

LD50, Rat, male and female, 2,050 mg/kg

Acute dermal toxicity
Prolonged skin contact is unlikely to result in absorption of harmful amounts.

LD50, Rabbit, > 5,000 mg/kg

Acute inhalation toxicity
Prolonged excessive exposure may cause adverse effects. Symptoms of excessive exposure may be anesthetic or narcotic effects; dizziness and drowsiness may be observed.

LC50, Rat, male, 4 Hour, > 1925 ppm No deaths occurred following exposure to a saturated atmosphere.

Skin corrosion/irritation
Brief contact may cause severe skin irritation with pain and local redness.
Prolonged contact may cause skin burns. Symptoms may include pain, severe local redness, swelling, and tissue damage.

Serious eye damage/eye irritation
May cause slight eye irritation.
Corneal injury is unlikely.

Sensitization
For skin sensitization:
Did not cause allergic skin reactions when tested in guinea pigs.

For respiratory sensitization:
No relevant data found.

Specific Target Organ Systemic Toxicity (Single Exposure)
Evaluation of available data suggests that this material is not an STOT-SE toxicant.

Specific Target Organ Systemic Toxicity (Repeated Exposure)
In animals, effects have been reported on the following organs:
Central nervous system.
Kidney.

Liver.
Peripheral nervous system.
Inhalation of diethylbenzene in concentrations above 100 ppm or ingestion of near lethal doses caused tissues of test animals to turn blue and urine to turn green.

Carcinogenicity
No relevant data found.

Teratogenicity
Has been toxic to the fetus in laboratory animals at doses toxic to the mother. Did not cause birth defects in laboratory animals.

Reproductive toxicity
In animal studies, did not interfere with reproduction.

Mutagenicity
In vitro genetic toxicity studies were negative. Animal genetic toxicity studies were negative.

Aspiration Hazard
May be fatal if swallowed and enters airways.

12. ECOLOGICAL INFORMATION

Ecotoxicological information appears in this section when such data is available.

Toxicity

Acute toxicity to fish
Material is highly toxic to aquatic organisms on an acute basis (LC50/EC50 between 0.1 and 1 mg/L in the most sensitive species tested).

LC50, Oncorhynchus mykiss (rainbow trout), flow-through test, 96 Hour, 0.673 mg/l, OECD Test Guideline 203

LC50, Pimephales promelas (fathead minnow), static test, 96 Hour, 26 mg/l

Acute toxicity to aquatic invertebrates
LC50, Daphnia magna (Water flea), static test, 48 Hour, 8.9 mg/l

EC50, Daphnia magna (Water flea), semi-static test, 48 Hour, 2.01 mg/l, OECD Test Guideline 202 or Equivalent

Acute toxicity to algae/aquatic plants
ErC50, Pseudokirchneriella subcapitata (green algae), 72 Hour, Growth rate inhibition, 1.21 mg/l

Persistence and degradability
Biodegradability: Biodegradation under aerobic static laboratory conditions is moderate (BOD20 or BOD28/ThOD between 10 and 40%). Material is not readily biodegradable according to OECD/EEC guidelines.
10-day Window: Fail
Biodegradation: 4.7 %
Exposure time: 28 d

Method: CO2 Evolution Test
10-day Window: Fail
Biodegradation: 0 %
Exposure time: 28 d
Method: OECD Test Guideline 301C or Equivalent

Theoretical Oxygen Demand: 3.22 mg/mg

Biological oxygen demand (BOD)

Incubation Time	BOD
5 d	17.000 %
10 d	27.000 %
20 d	33.000 %

Photodegradation
Test Type: Half-life (indirect photolysis)
Sensitizer: OH radicals
Atmospheric half-life: 9 - 16 d
Method: Estimated.

Bioaccumulative potential

Bioaccumulation: Bioconcentration potential is moderate (BCF between 100 and 3000 or Log Pow between 3 and 5).
Partition coefficient: n-octanol/water(log Pow): 4.58 Measured
Bioconcentration factor (BCF): 320 - 854 Fish 42 d Measured

Mobility in soil

Expected to be relatively immobile in soil (Koc > 5000).
Partition coefficient(Koc): 7400 Estimated.

13. DISPOSAL CONSIDERATIONS

Disposal methods: DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal practices must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. AS YOUR SUPPLIER, WE HAVE NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION: Composition Information. FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: Incinerator or other thermal destruction device.

14. TRANSPORT INFORMATION

DOT

Proper shipping name Diethylbenzene

UN number	UN 2049
Class	3
Packing group	III

Classification for SEA transport (IMO-IMDG):

Proper shipping name	DIETHYLBENZENE
UN number	UN 2049
Class	3
Packing group	III
Marine pollutant	Diethylbenzene
Transport in bulk according to Annex I or II of MARPOL 73/78 and the IBC or IGC Code	Consult IMO regulations before transporting ocean bulk

Classification for AIR transport (IATA/ICAO):

Proper shipping name	Diethylbenzene
UN number	UN 2049
Class	3
Packing group	III

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Transportation classifications may vary by container volume and may be influenced by regional or country variations in regulations. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. REGULATORY INFORMATION

OSHA Hazard Communication Standard
This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Sections 311 and 312
Fire Hazard
Acute Health Hazard
Chronic Health Hazard

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Section 313
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

Pennsylvania Worker and Community Right-To-Know Act:

To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)
This product contains no listed substances known to the State of California to cause cancer, birth defects or other reproductive harm, at levels which would require a warning under the statute.

United States TSCA Inventory (TSCA)
All components of this product are in compliance with the inventory listing requirements of the U.S. Toxic Substances Control Act (TSCA) Chemical Substance Inventory.

16. OTHER INFORMATION

Product Literature
Additional information on this product may be obtained by calling your sales or customer service contact.

Hazard Rating System
NFPA

Health	Fire	Reactivity
2	2	0

Revision
Identification Number: 101201621 / A211 / Issue Date: 10/21/2015 / Version: 9.0
Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

TWA	8-hr TWA
US WEEL	USA. Workplace Environmental Exposure Levels (WEEL)

Information Source and References
This SDS is prepared by Product Regulatory Services and Hazard Communications Groups from information supplied by internal references within our company.

DOW AGROSCIENCES LLC urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.

Hydrated Lime

Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations And According To The Hazardous Products Regulation (February 11, 2015).
Revision Date: 08/02/2018 Date of Issue: 12/15/2014 Version: 2.0

SECTION 1: IDENTIFICATION

1.1. Product Identifier

Product Form: Mixture

Product Name: Hydrated Lime, Slaked Lime, Dolomitic Hydrated Lime, Lime, Caustic Lime, Lime Hydrate, Calcium Hydroxide, Calcium Dihydroxide, Calcium Magnesium Hydroxide, Type N Lime, Type S Lime

Synonyms: Hydrated Lime

Note: This SDS covers many types of hydrated lime. Individual composition of hazardous constituents will vary between types of hydrated lime.

1.2. Intended Use of the Product

Hydrated lime is used as an additive for mortar, cement, concrete and concrete products. It is also used in soil stabilization, as an anti-stripping agent in asphalt, for pH adjustment, and in other products that are widely used in construction.

1.3. Name, Address, and Telephone of the Responsible Party

Company
Lafarge US
8700 West Bryn Mawr Avenue, Suite 300
Chicago, IL 60631
Information: 773-372-1000 (9am to 5pm CST)
Email: SDSinfo@Lafarge.com
Website: www.lafargeholcim.us

Company
Lafarge Canada

Eastern Canada
6509 Airport Road
Mississauga, ON L4V 157
Phone: (905) 738-7070

Western Canada
#300 115 Quarry Park Road SE
Calgary, AB T2C 5G9
Phone: (403) 271-9110

Website:www.lafarge.ca

1.4. Emergency Telephone Number

Emergency Number : Chemtrec 1-800-424-9300 (24 hours)

SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification of the Substance or Mixture

GHS-US/CA Classification

Skin Corr. 1C	H314
Eye Dam. 1	H318
Carc. 1A	H350

Full text of hazard classes and H-statements : see Section 16.

2.2. Label Elements

GHS-US/CA Labeling

Hazard Pictograms (GHS-US/CA) :

GHS05 GHS08

Signal Word (GHS-US/CA) : Danger

Hazard Statements (GHS-US/CA) : H314 - Causes severe skin burns and eye damage.
H318 - Causes serious eye damage.
H350 - May cause cancer (Inhalation).

Precautionary Statements (GHS-US/CA) : 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 hands, forearms, and other exposed areas thoroughly after handling.

P280 - Wear protective gloves, protective clothing, and eye 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.
P304+P340 - IF INHALED: 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.
P310 - Immediately call a POISON CENTER or doctor.
P321 - Specific treatment (see Section 4 on this SDS).
P363 - Wash contaminated clothing before reuse.
P405 - Store locked up.
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations.

2.3. Other Hazards

Exposure may aggravate pre-existing eye, skin, or respiratory conditions. Individuals with lung disease (e.g. bronchitis, emphysema, COPD, pulmonary disease) or sensitivity to hexavalent chromium can be aggravated by exposure.

2.4. Unknown Acute Toxicity (GHS-US/CA)

No data available

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.2. Mixture

Name	Product Identifier	% *	GHS Ingredient Classification
Calcium hydroxide	(CAS-No.) 1305-62-0	50 - 95	Skin Corr. 1C, H314 Eye Dam. 1, H318
Magnesium hydroxide	(CAS-No.) 1309-42-8	0 - 50	Not classified
Calcium oxide	(CAS-No.) 1305-78-8	0 - 5	Skin Irrit. 2, H315 Eye Dam. 1, H318 STOT SE 3, H335 Aquatic Acute 3, H402
Magnesium oxide (MgO)	(CAS-No.) 1309-48-4	0 - 5	Not classified
Limestone	(CAS-No.) 1317-65-3	0 - 3	Not classified
Quartz	(CAS-No.) 14808-60-7	0 - 1	Carc. 1A, H350 STOT SE 3, H335 STOT RE 1, H372

Full text of H-phrases: see Section 16.

*Percentages are listed in weight by weight percentage (w/w%) for liquid and solid ingredients. Gas ingredients are listed in volume by volume percentage (v/v%).

SECTION 4: FIRST AID MEASURES

4.1. Description of First-aid Measures

General: Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).

Inhalation: Remove to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/physician.

Skin Contact: Remove contaminated clothing. Immediately flush skin with plenty of water for at least 60 minutes. Wash contaminated clothing before reuse. Immediately call a POISON CENTER or doctor.

Eye Contact: Rinse cautiously with water for at least 60 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get immediate medical advice/attention.

Ingestion: Rinse mouth. Do NOT induce vomiting. Obtain emergency medical attention.

4.2. Most Important Symptoms and Effects Both Acute and Delayed

General: Causes severe skin burns and eye damage. May cause cancer.

Inhalation: May be corrosive to the respiratory tract. The three types of silicosis include: 1) Simple chronic silicosis – which results from long-term exposure (more than 20 years) to low amounts of respirable crystalline silica. Nodules of chronic inflammation and scarring provoked by the respirable crystalline silica form in the lungs and chest lymph nodes. This disease may feature breathlessness and may resemble chronic obstructive pulmonary disease (COPD); 2) Accelerated silicosis – occurs after exposure to larger amounts of respirable crystalline silica over a shorter period of time (5-15 years); 3) Acute silicosis – results from short-term exposure to very large amounts of respirable crystalline silica. The lungs become very inflamed and may fill with fluid, causing severe shortness of breath and low blood oxygen levels. Inflammation, scarring, and symptoms progress faster in accelerated silicosis than in simple silicosis. Progressive massive fibrosis may occur in simple or accelerated silicosis, but is more common in the accelerated form. Progressive massive fibrosis results from severe scarring and leads to the destruction of normal lung structures.

Skin Contact: Causes severe irritation which will progress to chemical burns. Hydrated lime may cause dry skin, discomfort, irritation, severe burns. Exposure of sufficient duration to wet or dry hydrated lime can cause serious, potentially irreversible damage to skin due to chemical (caustic) burns, including third degree burns. A skin exposure may be hazardous even if there is no pain or discomfort.

Eye Contact: Causes permanent damage to the cornea, iris, or conjunctiva. Hydrated lime dust may cause immediate or delayed irritation or inflammation. Eye contact with dry powder or with wet hydrated lime can cause moderate eye irritation, chemical burns and blindness. Eye exposures require immediate first aid and medical attention to prevent significant damage to the eye.

Ingestion: May cause burns or irritation of the linings of the mouth, throat, and gastrointestinal tract.

Chronic Symptoms: May cause cancer.

4.3. Indication of Any Immediate Medical Attention and Special Treatment Needed

If exposed or concerned, get medical advice and attention. If medical advice is needed, have product container or label at hand.

SECTION 5: FIRE-FIGHTING MEASURES

5.1. Extinguishing Media

Suitable Extinguishing Media: Water spray, dry chemical, foam, carbon dioxide.

Unsuitable Extinguishing Media: Do not use a heavy water stream. Use of heavy stream of water may spread fire.

5.2. Special Hazards Arising From the Substance or Mixture

Fire Hazard: Not considered flammable but may burn at high temperatures.

Explosion Hazard: Product is not explosive.

Reactivity: May react exothermically with water releasing heat. Adding an acid to a base or base to an acid may cause a violent reaction.

5.3. Advice for Firefighters

Precautionary Measures Fire: Exercise caution when fighting any chemical fire.

Firefighting Instructions: Use water spray or fog for cooling exposed containers.

Protection During Firefighting: Do not enter fire area without proper protective equipment, including respiratory protection.

Hazardous Combustion Products: Silicon oxides. Calcium oxides.

Reference to Other Sections

Refer to Section 9 for flammability properties.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal Precautions, Protective Equipment and Emergency Procedures

General Measures: Do not breathe dust. Do not get in eyes, on skin, or on clothing. Do not handle until all safety precautions have been read and understood.

6.1.1. For Non-Emergency Personnel

Protective Equipment: Use appropriate personal protective equipment (PPE).

Emergency Procedures: Evacuate unnecessary personnel.

6.1.2. For Emergency Personnel

Protective Equipment: Equip cleanup crew with proper protection.

Emergency Procedures: Upon arrival at the scene, a first responder is expected to recognize the presence of dangerous goods, protect oneself and the public, secure the area, and call for the assistance of trained personnel as soon as conditions permit. Ventilate area.

6.2. Environmental Precautions

Prevent entry to sewers and public waters.

6.3. Methods and Materials for Containment and Cleaning Up

For Containment: Contain solid spills with appropriate barriers and prevent migration and entry into sewers or streams. As an immediate precautionary measure, isolate spill or leak area in all directions.

Methods for Cleaning Up: Clean up spills immediately and dispose of waste safely. Recover the product by vacuuming, shoveling or sweeping. Transfer spilled material to a suitable container for disposal. Contact competent authorities after a spill. Cautiously neutralize spilled solid. Avoid actions that cause dust to become airborne during clean-up such as dry sweeping or using compressed air. Use HEPA vacuum or thoroughly wet with water to clean-up dust. Use PPE described in Section 8.

6.4. Reference to Other Sections

See Section 8 for exposure controls and personal protection and Section 13 for disposal considerations.

SECTION 7: HANDLING AND STORAGE

7.1. Precautions for Safe Handling

Additional Hazards When Processed: May release corrosive vapors. Cutting, crushing or grinding wet or dry lime or other crystalline silica-bearing materials will release respirable crystalline silica. Use all appropriate measures of dust control or suppression, and Personal Protective Equipment (PPE) described in Section 8 below.

Precautions for Safe Handling: Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Do not get in eyes, on skin, or on clothing. Handle empty containers with care because they may still present a hazard. Do not breathe dust. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood.

Hygiene Measures: Handle in accordance with good industrial hygiene and safety procedures.

7.2. Conditions for Safe Storage, Including Any Incompatibilities

Technical Measures: Comply with applicable regulations.

Storage Conditions: Keep container closed when not in use. Store in a dry, cool place. Store in original container or corrosive resistant and/or lined container. Store away from incompatible materials.

Incompatible Materials: Wet hydrated lime and cement is alkaline and is incompatible with acids, ammonium salts and aluminum metal. Hydrated lime and cement dissolves in hydrofluoric acid, producing corrosive silicon tetrafluoride gas. Hydrated lime and cement reacts with water to form silicates and calcium hydroxide. Silicates react with powerful oxidizers such as fluorine, boron trifluoride, chlorine trifluoride, manganese trifluoride, and oxygen difluoride.

7.3. Specific End Use(s)

Hydrated lime is used as an additive for mortar, cement, concrete and concrete products. It is also used in soil stabilization, as an anti-stripping agent in asphalt, for pH adjustment, and in other products that are widely used in construction.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control Parameters

For substances listed in Section 3 that are not listed here, there are no established Exposure limits from the manufacturer, supplier, importer, or the appropriate advisory agency including: ACGIH (TLV), AIHA (WEEL), NIOSH (REL), OSHA (PEL), Canadian provincial governments, or the Mexican government.

Quartz (14808-60-7)		
Mexico	OEL TWA (mg/m³)	0.1 mg/m³ (respirable fraction)
USA ACGIH	ACGIH TWA (mg/m³)	0.025 mg/m³ (respirable particulate matter)
USA ACGIH	ACGIH chemical category	A2 - Suspected Human Carcinogen
USA OSHA	OSHA PEL (TWA) (mg/m³)	50 µg/m³
USA NIOSH	NIOSH REL (TWA) (mg/m³)	0.05 mg/m³ (respirable dust)
USA IDLH	US IDLH (mg/m³)	50 mg/m³ (respirable dust)
Alberta	OEL TWA (mg/m³)	0.025 mg/m³ (respirable particulate)
British Columbia	OEL TWA (mg/m³)	0.025 mg/m³ (respirable)
Manitoba	OEL TWA (mg/m³)	0.025 mg/m³ (respirable particulate matter)
New Brunswick	OEL TWA (mg/m³)	0.1 mg/m³ (respirable fraction)
Newfoundland & Labrador	OEL TWA (mg/m³)	0.025 mg/m³ (respirable particulate matter)
Nova Scotia	OEL TWA (mg/m³)	0.025 mg/m³ (respirable particulate matter)
Nunavut	OEL TWA (mg/m³)	0.05 mg/m³ (respirable fraction)
Northwest Territories	OEL TWA (mg/m³)	0.05 mg/m³ (respirable fraction)
Ontario	OEL TWA (mg/m³)	0.1 mg/m³ (designated substances regulation-respirable)
Prince Edward Island	OEL TWA (mg/m³)	0.025 mg/m³ (respirable particulate matter)

Québec	VEMP (mg/m³)	0.1 mg/m³ (respirable dust)
Saskatchewan	OEL TWA (mg/m³)	0.05 mg/m³ (respirable fraction)
Yukon	OEL TWA (mg/m³)	300 particle/mL

Limestone (1317-65-3)		
Mexico	OEL TWA (mg/m³)	10 mg/m³
Mexico	OEL STEL (mg/m³)	20 mg/m³
USA OSHA	OSHA PEL (TWA) (mg/m³)	15 mg/m³ (total dust) 5 mg/m³ (respirable fraction)
USA NIOSH	NIOSH REL (TWA) (mg/m³)	10 mg/m³ (total dust) 5 mg/m³ (respirable dust)
Alberta	OEL TWA (mg/m³)	10 mg/m³
British Columbia	OEL STEL (mg/m³)	20 mg/m³ (total dust)
British Columbia	OEL TWA (mg/m³)	10 mg/m³ (total dust) 3 mg/m³ (respirable fraction)
New Brunswick	OEL TWA (mg/m³)	10 mg/m³ (particulate matter containing no Asbestos and <1% Crystalline silica)
Nunavut	OEL STEL (mg/m³)	20 mg/m³
Nunavut	OEL TWA (mg/m³)	10 mg/m³
Northwest Territories	OEL STEL (mg/m³)	20 mg/m³
Northwest Territories	OEL TWA (mg/m³)	10 mg/m³
Québec	VEMP (mg/m³)	10 mg/m³ (Limestone, containing no Asbestos and <1% Crystalline silica-total dust)
Saskatchewan	OEL STEL (mg/m³)	20 mg/m³
Saskatchewan	OEL TWA (mg/m³)	10 mg/m³
Yukon	OEL STEL (mg/m³)	20 mg/m³
Yukon	OEL TWA (mg/m³)	30 mppcf 10 mg/m³

Calcium oxide (1305-78-8)		
Mexico	OEL TWA (mg/m³)	2 mg/m³
USA ACGIH	ACGIH TWA (mg/m³)	2 mg/m³
USA OSHA	OSHA PEL (TWA) (mg/m³)	5 mg/m³
USA NIOSH	NIOSH REL (TWA) (mg/m³)	2 mg/m³
USA IDLH	US IDLH (mg/m³)	25 mg/m³
Alberta	OEL TWA (mg/m³)	2 mg/m³
British Columbia	OEL TWA (mg/m³)	2 mg/m³
Manitoba	OEL TWA (mg/m³)	2 mg/m³
New Brunswick	OEL TWA (mg/m³)	2 mg/m³
Newfoundland & Labrador	OEL TWA (mg/m³)	2 mg/m³
Nova Scotia	OEL TWA (mg/m³)	2 mg/m³
Nunavut	OEL STEL (mg/m³)	4 mg/m³
Nunavut	OEL TWA (mg/m³)	2 mg/m³
Northwest Territories	OEL STEL (mg/m³)	4 mg/m³
Northwest Territories	OEL TWA (mg/m³)	2 mg/m³
Ontario	OEL TWA (mg/m³)	2 mg/m³
Prince Edward Island	OEL TWA (mg/m³)	2 mg/m³
Québec	VEMP (mg/m³)	2 mg/m³
Saskatchewan	OEL STEL (mg/m³)	4 mg/m³
Saskatchewan	OEL TWA (mg/m³)	2 mg/m³
Yukon	OEL STEL (mg/m³)	4 mg/m³
Yukon	OEL TWA (mg/m³)	2 mg/m³

Magnesium oxide (MgO) (1309-48-4)		
Mexico	OEL TWA (mg/m³)	10 mg/m³ (fume)

USA ACGIH	ACGIH TWA (mg/m³)	10 mg/m³ (inhalable particulate matter)
USA ACGIH	ACGIH chemical category	Not Classifiable as a Human Carcinogen
USA OSHA	OSHA PEL (TWA) (mg/m³)	15 mg/m³ (fume, total particulate)
USA IDLH	US IDLH (mg/m³)	750 mg/m³ (fume)
Alberta	OEL TWA (mg/m³)	10 mg/m³ (fume)
British Columbia	OEL STEL (mg/m³)	10 mg/m³ (respirable dust and fume)
British Columbia	OEL TWA (mg/m³)	10 mg/m³ (fume, inhalable) 3 mg/m³ (respirable dust and fume)
Manitoba	OEL TWA (mg/m³)	10 mg/m³ (inhalable particulate matter)
New Brunswick	OEL TWA (mg/m³)	10 mg/m³ (fume)
Newfoundland & Labrador	OEL TWA (mg/m³)	10 mg/m³ (inhalable particulate matter)
Nova Scotia	OEL TWA (mg/m³)	10 mg/m³ (inhalable particulate matter)
Nunavut	OEL STEL (mg/m³)	20 mg/m³ (inhalable fraction)
Nunavut	OEL TWA (mg/m³)	10 mg/m³ (inhalable fraction)
Northwest Territories	OEL STEL (mg/m³)	20 mg/m³ (inhalable fraction)
Northwest Territories	OEL TWA (mg/m³)	10 mg/m³ (inhalable fraction)
Ontario	OEL TWA (mg/m³)	10 mg/m³ (inhalable)
Prince Edward Island	OEL TWA (mg/m³)	10 mg/m³ (inhalable particulate matter)
Québec	VEMP (mg/m³)	10 mg/m³ (fume)
Saskatchewan	OEL STEL (mg/m³)	20 mg/m³ (inhalable fraction)
Saskatchewan	OEL TWA (mg/m³)	10 mg/m³ (inhalable fraction)
Yukon	OEL STEL (mg/m³)	10 mg/m³ (fume)
Yukon	OEL TWA (mg/m³)	10 mg/m³ (fume)

Calcium hydroxide (1305-62-0)		
Mexico	OEL TWA (mg/m³)	5 mg/m³
USA ACGIH	ACGIH TWA (mg/m³)	5 mg/m³
USA OSHA	OSHA PEL (TWA) (mg/m³)	15 mg/m³ (total dust) 5 mg/m³ (respirable fraction)
USA NIOSH	NIOSH REL (TWA) (mg/m³)	5 mg/m³
Alberta	OEL TWA (mg/m³)	5 mg/m³
British Columbia	OEL TWA (mg/m³)	5 mg/m³
Manitoba	OEL TWA (mg/m³)	5 mg/m³
New Brunswick	OEL TWA (mg/m³)	5 mg/m³
Newfoundland & Labrador	OEL TWA (mg/m³)	5 mg/m³
Nova Scotia	OEL TWA (mg/m³)	5 mg/m³
Nunavut	OEL STEL (mg/m³)	10 mg/m³
Nunavut	OEL TWA (mg/m³)	5 mg/m³
Northwest Territories	OEL STEL (mg/m³)	10 mg/m³
Northwest Territories	OEL TWA (mg/m³)	5 mg/m³
Ontario	OEL TWA (mg/m³)	5 mg/m³
Prince Edward Island	OEL TWA (mg/m³)	5 mg/m³
Québec	VEMP (mg/m³)	5 mg/m³
Saskatchewan	OEL STEL (mg/m³)	10 mg/m³
Saskatchewan	OEL TWA (mg/m³)	5 mg/m³
Yukon	OEL STEL (mg/m³)	10 mg/m³
Yukon	OEL TWA (mg/m³)	5 mg/m³

8.2. Exposure Controls

Appropriate Engineering Controls: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Ensure adequate ventilation, especially in confined areas. Ensure all national/local regulations are observed.

Personal Protective Equipment: Gloves. Protective clothing. Protective goggles. Face shield. Insufficient ventilation: wear respiratory protection.

Materials for Protective Clothing: Chemically resistant materials and fabrics. Corrosion-proof clothing.

Hand Protection: Wear protective gloves.

Eye and Face Protection: Chemical safety goggles and face shield.

Skin and Body Protection: Wear suitable protective clothing.

Respiratory Protection: If exposure limits are exceeded or irritation is experienced, approved respiratory protection should be worn. In case of inadequate ventilation, oxygen deficient atmosphere, or where exposure levels are not known wear approved respiratory protection.

Other Information: When using, do not eat, drink or smoke.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on Basic Physical and Chemical Properties

Physical State	:	Solid
Appearance	:	White or Grey Powder
Odor	:	Odorless
Odor Threshold	:	Not available
pH	:	12 - 13 (In Water)
Evaporation Rate	:	Not available
Melting Point	:	Not available
Freezing Point	:	Not available
Boiling Point	:	> 1000 °C (> 1832 °F)
Flash Point	:	Not available
Auto-ignition Temperature	:	Not available
Decomposition Temperature	:	Not available
Flammability (solid, gas)	:	Not available
Lower Flammable Limit	:	Not available
Upper Flammable Limit	:	Not available
Vapor Pressure	:	Not available
Relative Vapor Density at 20°C	:	Not available
Relative Density	:	1.9 - 2.4 (Water = 1)
Specific Gravity	:	Not available
Solubility	:	Negligible.
Partition Coefficient: N-Octanol/Water	:	Not available
Viscosity	:	Not available

SECTION 10: STABILITY AND REACTIVITY

10.1. Reactivity: May react exothermically with water releasing heat. Adding an acid to a base or base to an acid may cause a violent reaction.

10.2. Chemical Stability: Stable under recommended handling and storage conditions (see Section 7).

10.3. Possibility of Hazardous Reactions: Hazardous polymerization will not occur.

10.4. Conditions to Avoid: Extremely high or low temperatures and incompatible materials.

10.5. Incompatible Materials: Wet hydrated lime and cement is alkaline and is incompatible with acids, ammonium salts and aluminum metal. Hydrated lime and cement dissolves in hydrofluoric acid, producing corrosive silicon tetrafluoride gas. Hydrated lime and cement reacts with water to form silicates and calcium hydroxide. Silicates react with powerful oxidizers such as fluorine, boron trifluoride, chlorine trifluoride, manganese trifluoride, and oxygen difluoride.

10.6. Hazardous Decomposition Products: Hydrated lime will decompose at 540ºC to produce calcium oxide (quicklime), magnesium oxide, and water.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. Information on Toxicological Effects - Product

Acute Toxicity (Oral): Not classified

Acute Toxicity (Dermal): Not classified

Acute Toxicity (Inhalation): Not classified

LD50 and LC50 Data: Not available

Skin Corrosion/Irritation: Causes severe skin burns and eye damage.

pH: 12 - 13 (in water)

Eye Damage/Irritation: Causes serious eye damage.

pH: 12 - 13 (in water)

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Carcinogenicity: May cause cancer (Inhalation).

Specific Target Organ Toxicity (Repeated Exposure): Not classified

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Single Exposure): Not classified

Aspiration Hazard: Not classified

Symptoms/Injuries After Inhalation: May be corrosive to the respiratory tract. The three types of silicosis include: 1) Simple chronic silicosis – which results from long-term exposure (more than 20 years) to low amounts of respirable crystalline silica. Nodules of chronic inflammation and scarring provoked by the respirable crystalline silica form in the lungs and chest lymph nodes. This disease may feature breathlessness and may resemble chronic obstructive pulmonary disease (COPD); 2) Accelerated silicosis – occurs after exposure to larger amounts of respirable crystalline silica over a shorter period of time (5-15 years); 3) Acute silicosis – results from short-term exposure to very large amounts of respirable crystalline silica. The lungs become very inflamed and may fill with fluid, causing severe shortness of breath and low blood oxygen levels. Inflammation, scarring, and symptoms progress faster in accelerated silicosis than in simple silicosis. Progressive massive fibrosis may occur in simple or accelerated silicosis, but is more common in the accelerated form. Progressive massive fibrosis results from severe scarring and leads to the destruction of normal lung structures.

Symptoms/Injuries After Skin Contact: Causes severe irritation which will progress to chemical burns. Hydrated lime may cause dry skin, discomfort, irritation, severe burns. Exposure of sufficient duration to wet or dry hydrated lime can cause serious, potentially irreversible damage to skin due to chemical (caustic) burns, including third degree burns. A skin exposure may be hazardous even if there is no pain or discomfort.

Symptoms/Injuries After Eye Contact: Causes permanent damage to the cornea, iris, or conjunctiva. Hydrated lime dust may cause immediate or delayed irritation or inflammation. Eye contact with dry powder or with wet hydrated lime can cause moderate eye irritation, chemical burns and blindness. Eye exposures require immediate first aid and medical attention to prevent significant damage to the eye.

Symptoms/Injuries After Ingestion: May cause burns or irritation of the linings of the mouth, throat, and gastrointestinal tract.

Chronic Symptoms: May cause cancer.

11.2. Information on Toxicological Effects - Ingredient(s)

LD50 and LC50 Data:

Quartz (14808-60-7)	
LD50 Oral Rat	> 5000 mg/kg
LD50 Dermal Rat	> 5000 mg/kg
Calcium oxide (1305-78-8)	
LD50 Oral Rat	> 2000 mg/kg
LD50 Dermal Rabbit	> 2500 mg/kg
Magnesium oxide (MgO) (1309-48-4)	
LD50 Oral Rat	3870 mg/kg
Calcium hydroxide (1305-62-0)	
LD50 Oral Rat	7340 mg/kg
Magnesium hydroxide (1309-42-8)	
LD50 Oral Rat	8500 mg/kg
Quartz (14808-60-7)	

IARC Group	1
National Toxicology Program (NTP) Status	Known Human Carcinogens.
OSHA Hazard Communication Carcinogen List	In OSHA Hazard Communication Carcinogen list.

SECTION 12: ECOLOGICAL INFORMATION

12.1. Toxicity

Ecology - General: Not classified.

Calcium oxide (1305-78-8)	
LC50 Fish 1	50.6 mg/l

12.2. Persistence and Degradability

Hydrated Lime	
Persistence and Degradability	Not established.

12.3. Bioaccumulative Potential

Hydrated Lime	
Bioaccumulative Potential	Not established.

Calcium oxide (1305-78-8)	
BCF Fish 1	(no bioaccumulation)

Calcium hydroxide (1305-62-0)	
BCF Fish 1	(no bioaccumulation)

12.4. Mobility in Soil

Not available

12.5. Other Adverse Effects

Other Information: Avoid release to the environment.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Waste Disposal Recommendations: Dispose of waste material in accordance with all local, regional, national, provincial, territorial and international regulations.

Additional Information: Container may remain hazardous when empty. Continue to observe all precautions.

Ecology - Waste Materials: Avoid release to the environment.

SECTION 14: TRANSPORT INFORMATION

The shipping description(s) stated herein were prepared in accordance with certain assumptions at the time the SDS was authored, and can vary based on a number of variables that may or may not have been known at the time the SDS was issued.

14.1. In Accordance with DOT Not regulated for transport

14.2. In Accordance with IMDG Not regulated for transport

14.3. In Accordance with IATA Not regulated for transport

14.4. In Accordance with TDG Not regulated for transport

SECTION 15: REGULATORY INFORMATION

15.1. US Federal Regulations

Hydrated Lime	
SARA Section 311/312 Hazard Classes	Health hazard - Skin corrosion or Irritation Health hazard - Serious eye damage or eye irritation Health hazard - Carcinogenicity

Quartz (14808-60-7)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

Limestone (1317-65-3)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

Calcium oxide (1305-78-8)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

Magnesium oxide (MgO) (1309-48-4)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Calcium hydroxide (1305-62-0)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Magnesium hydroxide (1309-42-8)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

15.2. US State Regulations

Quartz (14808-60-7)	
U.S. - California - Proposition 65 - Carcinogens List	WARNING: This product contains chemicals known to the State of California to cause cancer.

Quartz (14808-60-7)

U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) List

Limestone (1317-65-3)

U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) List

Calcium oxide (1305-78-8)

U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) List

Magnesium oxide (MgO) (1309-48-4)

U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) List

Calcium hydroxide (1305-62-0)

U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) List

15.3. Canadian Regulations

Quartz (14808-60-7)

Listed on the Canadian DSL (Domestic Substances List)

Limestone (1317-65-3)

Listed on the Canadian NDSL (Non-Domestic Substances List)

Calcium oxide (1305-78-8)

Listed on the Canadian DSL (Domestic Substances List)

Magnesium oxide (MgO) (1309-48-4)

Listed on the Canadian DSL (Domestic Substances List)

Calcium hydroxide (1305-62-0)

Listed on the Canadian DSL (Domestic Substances List)

Magnesium hydroxide (1309-42-8)

Listed on the Canadian DSL (Domestic Substances List)

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF PREPARATION OR LAST REVISION

Date of Preparation or Latest Revision : 08/02/2018

Other Information : This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200 and Canada's Hazardous Products Regulations (HPR) SOR/2015-17.

GHS Full Text Phrases:

Aquatic Acute 3	Hazardous to the aquatic environment - Acute Hazard Category 3
Carc. 1A	Carcinogenicity Category 1A
Eye Dam. 1	Serious eye damage/eye irritation Category 1
Skin Corr. 1C	Skin corrosion/irritation Category 1C
Skin Irrit. 2	Skin corrosion/irritation Category 2
STOT RE 1	Specific target organ toxicity (repeated exposure) Category 1
STOT SE 3	Specific target organ toxicity (single exposure) Category 3
H314	Causes severe skin burns and eye damage
H315	Causes skin irritation
H318	Causes serious eye damage
H335	May cause respiratory irritation
H350	May cause cancer
H372	Causes damage to organs through prolonged or repeated exposure
H402	Harmful to aquatic life

An electronic version of this SDS is available: for Canada on www.lafarge.ca under the Health and Safety Section, and for US on www.lafargeholcim.us under the Our Solutions and Products Section. Please direct any inquiries regarding the content of this SDS to SDSinfo@Lafarge.com.

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NO WARRANTY IS MADE, EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OTHERWISE.

NA GHS SDS 2015 (Can, US, Mex)

MSDS Number: **S3242** * * * * * *Effective Date:* ***08/17/06*** * * * * * *Supercedes:* ***12/03/03***

MSDS **Material Safety Data Sheet**

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

SODIUM CARBONATE ANHYDROUS

1. Product Identification

Synonyms: Carbonic acid, disodium salt; disodium carbonate; soda ash
CAS No.: 497-19-8
Molecular Weight: 105.99
Chemical Formula: Na2CO3
Product Codes:
J.T. Baker: 3602, 3604, 3605, 3606, 4502, 4923, 5198
Mallinckrodt: 1338, 3604, 7468, 7472, 7521, 7527, 7528, 7698

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sodium Carbonate	497-19-8	99 - 100%	Yes

3. Hazards Identification

Emergency Overview

DANGER! MAY CAUSE EYE BURNS. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 1 - Slight
Flammability Rating: 1 - Slight
Reactivity Rating: 2 - Moderate
Contact Rating: 3 - Severe (Life)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: Green (General Storage)

Potential Health Effects

Inhalation:
Inhalation of dust may cause irritation to the respiratory tract. Symptoms from excessive inhalation of dust may include coughing and difficult breathing. Excessive contact is known to cause damage to the nasal septum.
Ingestion:
Sodium carbonate is only slightly toxic, but large doses may be corrosive to the gastro-intestinal tract where symptoms may include severe abdominal pain, vomiting, diarrhea, collapse and death.
Skin Contact:
Excessive contact may cause irritation with blistering and redness. Solutions may cause severe irritation or burns.
Eye Contact:
Contact may be corrosive to eyes and cause conjuctival edema and corneal destruction. Risk of serious injury increases if eyes are kept tightly closed. Other symptoms may appear from absorption of sodium carbonate into the bloodstream via the eyes.
Chronic Exposure:
Prolonged or repeated skin exposure may cause sensitization.
Aggravation of Pre-existing Conditions:
No information found.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
Immediately flush skin with plenty of soap and water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse.

Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:
Consider endoscopy in all suspected cases of sodium carbonate poisoning. Perform blood analysis to determine if dehydration, acidosis, or other electrolyte imbalances occurred.

---

5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard.
Explosion:
Not considered an explosion hazard, but sodium carbonate may explode when applied to red-hot aluminum.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
Use protective clothing and breathing equipment appropriate for the surrounding fire.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

---

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
None established.
Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
For conditions of use where exposure to dust or mist is apparent and engineering controls are not feasible, a particulate respirator (NIOSH type N95 or better filters) may be worn. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear protective gloves and clean body-covering clothing.

Eye Protection:
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
White powder or granules.

Odor:
Odorless.

Solubility:
45.5 g/100 ml water @ 100C (212F)

Specific Gravity:
2.53

pH:
11.6 Aqueous solution

% Volatiles by volume @ 21C (70F):
0

Boiling Point:
Decomposes.

Melting Point:
851C (1564F)

Vapor Density (Air=1):
No information found.

Vapor Pressure (mm Hg):
No information found.

Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage. Hygroscopic. Readily absorbs moisture from the air. Solutions are strong bases.
Hazardous Decomposition Products:
Oxides of carbon and sodium oxide.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Fluorine, aluminum, phosphorous pentoxide, sulfuric acid, zinc, lithium, moisture, calcium hydroxide and 2,4,6-trinitrotoluene. Reacts violently with acids to form carbon dioxide.
Conditions to Avoid:
Moisture, heat, dusting and incompatibles.

---

11. Toxicological Information

For Sodium Carbonate:
Oral rat LD50: 4090 mg/kg; inhalation rat LC50: 2300 mg/m3/2H; irritation eye rabbit: 50 mg severe; investigated as a mutagen, reproductive effector.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Sodium Carbonate (497-19-8)	No	No	None

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12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
96 Hr LC50 Lepomis macrochirus: 300 mg/L [static];
48 Hr EC50 Daphnia magna: 265 mg/L

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13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

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14. Transport Information

Not regulated.

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15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------------------------------

Ingredient	TSCA	EC	Japan	Australia
Sodium Carbonate (497-19-8)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\--------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Sodium Carbonate (497-19-8)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Sodium Carbonate (497-19-8)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Sodium Carbonate (497-19-8)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: No Fire: No Pressure: No
Reactivity: No (Pure / Solid)

Australian Hazchem Code: None allocated.
Poison Schedule: S5
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **2** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
DANGER! MAY CAUSE EYE BURNS. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT.
Label Precautions:

Do not get in eyes, on skin, or on clothing.
Avoid breathing dust.
Keep container closed.
Use with adequate ventilation.
Wash thoroughly after handling.

Label First Aid:

In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. Get medical attention for any breathing difficulty. In all cases, get medical attention.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 12.

Disclaimer:

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MATERIAL SAFETY DATA SHEET

METHANOL

SECTION 1 – PRODUCT AND COMPANY IDENTIFICATION

Product Name	Methanol (CH_3OH)
Synonyms	Alcohol, Methyl Hydroxide, Methyl Hydrate, Wood Alcohol, Wood Spirit
Product Use	Solvent, Fuel, Feedstock
Company Identification	Methanol Holdings (Trinidad) Limited Atlantic Avenue, Point Lisas Industrial Estate Point Lisas, Trinidad, West Indies.

Emergency Contact (24 hours)	
North America	CHEMTREC – 1-800-424-9300
Europe	Giftinformationszentrum Nord - 011-49-551-19240
Trinidad	Industrial Plant Services Limited – 1-868-636-1251

Non-Emergency Contact	
North America	Southern Chemical Corporation – 1-281-799-4416
Europe	Helm AG - 011-19-40-23750
Trinidad	Methanol Holdings (Trinidad) Limited – 1-868-636-2906

SECTION 2 – COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Name	CAS No.	Percent	EINECS / ELINCS
Methyl Alcohol	67-56-1	99+	200-659-6

Hazard Symbols: T, F
ACGIH STEL: 250 ppm, skin notation
ACGIH TLV: 200 ppm, skin
OSHA PEL: 200 ppm

SECTION 3 – HAZARDS IDENTIFICATION

Emergency Overview

POISON! DANGER! Vapor harmful. May be fatal or cause blindness if swallowed. Harmful if inhaled or absorbed through the skin. Flammable liquid and vapor. Causes irritation to skin, eyes and respiratory tract. Affects central nervous system and liver.

Target Organs: Kidneys, heart, central nervous system, liver, eyes.

Potential Health Effects

Inhalation: An irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Once absorbed into the body, it is very slowly eliminated. Symptoms of over-exposure may include headache, drowsiness, nausea, vomiting, blurred vision, blindness, coma, and death. A person may get better but then worse up to 30 hours later.

Ingestion: Toxic. Symptoms similar to those for inhalation, but severity and speed of appearance may be greater. May be fatal or cause blindness. Usual fatal dose: 100 – 125 ml. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure.

Skin Contact: Methyl Alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur in harmful amounts; symptoms may parallel inhalation exposure.

Eye Contact: Irritant, characterized by a burning sensation, redness, tearing, inflammation, possible corneal injury, painful sensitization to light. Continued exposure may cause lesions.

Chronic Exposure: Marked impairment of vision has been reported. Repeated or prolonged skin contact may cause dermatitis. Chronic exposure may cause reproductive disorders and teratogenic effects. Laboratory experiments have resulted in mutagenic effects.

Aggravation of Pre-Existing Conditions: Persons with pre-existing skin disorders or eye problems or impaired liver or kidney function may be more susceptible to the effects of the substance.

Other

- Highly flammable.
- May build up Electrostatic charges: risk of ignition.
- Vapor-Air mixture is flammable / explosive within the explosion limits.

National Fire Protection Association (NFPA) 704 Hazard Identification Rating

Health:	1	**Rating System**
Reactivity:	0	0 = No Hazard
Flammability:	3	1 = Slight Hazard
Special Hazards:	None	2 = Moderate Hazard
		3 = Serious Hazard
		4 = Severe Hazard

SECTION 4 – FIRST AID MEASURES

Eyes
Immediately flush eyes with an ample amount of water for at least 15 minutes, occasionally lifting upper and lower eyelids. Get medical help immediately.

Skin
Immediately wash skin with lots of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists.

Inhalation
Remove from exposure to fresh air immediately. If breathing is difficult, give oxygen if available. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.

Ingestion
The ingestion of methanol is potentially life threatening. Onset of symptoms may be delayed for 18 to 24 hours after digestion. If the victim is conscious and medical help is not immediately available, give 2 to 4 cupfuls of milk or water. Do not induce vomiting! Transport victim to a medical facility immediately.

Note to Physician
Effects may be delayed. Ethanol may inhibit methanol metabolism.

SECTION 5 – FIRE FIGHTING MEASURES

Flash Point:	11°C	
Lower Explosive Limit:	6%	(NFPA 1978)
Upper Explosive Limit:	36%	(NFPA 1978)
Auto Ignition Temp.:	385 °C	NFPA 1978)

Hazardous Combustion Products: Toxic gases and vapors; Oxides of Carbon and Formaldehyde.

Extinguishing Media
- Small fires: Use dry chemical, carbon dioxide, water spray or alcohol resistant foam. Use water sprays to cool fire-exposed containers.
- Large fires: Use water spray, water fog or alcohol-resistant foam.

Special Protective Equipment for Firefighters
- Firefighters must wear full face, positive pressure self-contained breathing apparatus, MSHA / NIOSH (approved or equivalent), and full protective gear.
- Protective fire fighting structural clothing may not offer complete protection from a methanol fire if there is liquid methanol or vapor levels above the threshold limit value (TLV). Use of HAZMAT suits are recommended.

Important Information
Methanol burns with a clean, clear flame, which is almost invisible in daylight. Containers may build up pressure if exposed to heat and/or fire. Cool tanks / drums with water spray and remove them to safety. Fire fighting water should be contained if possible, as it is toxic and can cause environmental damage. Water runoff can cause environmental damage. Vapors can travel to a source of ignition and flash back. Material is lighter than water, and so a fire can be spread by the use of water. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Responders should stay upwind.

SECTION 6 – ACCIDENTAL RELEASE MEASURES

Procedure
- Wear appropriate personal protective equipment as specified in Section 8.
- Stay upwind.
- Ventilate area of leak or spill and isolate hazard area.
- Eliminate all sources of ignition.
- Keep unnecessary and unprotected personnel from entering the hazard zone.
- Contain and recover liquid where possible or dilute with water or use alcohol-resistant foam to reduce fire hazard. Collect liquid in an appropriate container or absorb with an inert material (e.g. vermiculite, dry sand, earth) and place in a chemical waste container. Do not use combustible materials such as saw dust.
- Use non-sparking tools and equipment.
- Do not flush to sewer and prevent from entering confined spaces.
- US regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities.

Waste Disposal
- Recycling is the recommended disposal method.
- Incineration should only be performed using a legally approved incinerator fitted with emission controls.
- Methanol wastes are not suitable for underground injection.
- Biological treatment may be used for dilute aqueous waste methanol.

SECTION 7 – HANDLING AND STORAGE

Handling
- Wash hands thoroughly after handling. In the event of exposure, remove contaminated clothing and wash before reuse.
- Containers should be grounded and bonded when transferring material in order to avoid static sparks.
- Do not breathe vapor, mist or gas. Do not get in eyes, skin or clothing.
- Use non-sparking type tools and equipment, including explosion-proof ventilation.
- Empty containers retain product residue (liquid and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, sparks, flame, static electricity or other sources of ignition.
- Keep container tightly closed.

Storage

- Keep away from heat, sparks, flames (all sources of ignition). Keep away from oxidizers, acids and bases.
- Store in a cool, dry, well-ventilated area away from incompatible substances.
- Outside or detached storage is recommended.
- Tanks must be grounded and vented and have vapor emission controls including floating roofs, inert gas blanketing to prevent the formation of explosive mixtures and pressure vacuum relief valves to control tank pressures. Tanks should be of welded construction and should also be diked.
- Do not store in aluminum or lead containers. (Anhydrous methanol is non-corrosive to most metals at ambient temperatures except lead and magnesium. Coatings of copper and its alloys, zinc, or aluminum are unsuitable for storage as they are attacked slowly. Mild Steel is the recommended construction material for tanks.)
- Plastics may be used for short-term storage, but not recommended for long-term use due to deterioration effects and the subsequent risk of contamination.

SECTION 8 – EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Controls: Use explosion-proof ventilation equipment. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits. Use only under a chemical fume hood. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

Personal Protective Equipment

Respiratory Protection: A respiratory protection program that meets OSHA's 29 CFR 1910.134) and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

Eye Protection: Use face shield and chemical flash goggles.

Skin Protection: Rubber (Butyl or Nitrile) or neoprene gloves and additional protection including impervious boots, aprons, or coveralls as needed in areas of unusual exposure.

PPE must not be considered a long-term solution to exposure control. PPE usage must be accompanied by employer programs to properly select, maintain, clean, fit and use. Consult a competent industrial hygiene resource to determine hazard potential and/or the PPE manufacturers to ensure adequate protection.

SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Appearance:	Clear, Colorless
Odor:	Slight Alcohol Odor
pH Value:	Not Applicable
Molecular Wt.:	32.04
Boiling Point (760 mm Hg):	64.5^0C
Flash Point:	11^0C
Auto Ignition Temp.:	385^0C (NFPA 1978)
Vapor Pressure: @ 200C	12.8 kPa
Vapor Density:	1.11 (Air = 1)
Viscosity:	0.55 cP (20 ^{0}C)
% Volatile / Volume:	100.0
Freezing / Melting Pt.:	-98 ^{0}C (-144 ^{0}F)
Water Solubility:	Complete
Soluble in:	Water, Ethanol, Ether, Acetone, and Chloroform
Partition Coefficient n-octanol/water:	-0.82 / -0.66
Evaporation Rate: (BuAc=1)	5.9
(Ether = 1)	5.3
Specific Gravity:	0.791 – 0.793
Saturation Concentration:	166 g/m^3

SECTION 10 – STABILITY & REACTIVITY

Chemical Stability: Stable under normal temperatures and pressures.

Conditions to Avoid: High temperatures, incompatible materials, ignition sources, oxidizers.

Incompatible Materials: Avoid contact with strong oxidizers, strong mineral or organic acids and strong bases. Contact with these materials may cause a violent or explosive reaction. May be corrosive to lead, aluminum, magnesium and platinum.

Hazardous Decomposition Products
Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide, formaldehyde.

Hazardous Polymerization
Will not occur.

SECTION 11 – TOXICOLOGICAL INFORMATION

Acute Toxicity

LD_{50}:	**Oral, Mouse**	**-**	7300 mg/Kg
LD_{50}:	**Oral, Rabbit**	**-**	14200 mg/Kg
LD_{50}:	**Oral, Rat**	**-**	5628 mg/Kg
LD_{50}:	**Skin, Rabbit**	**-**	15800 mg/Kg
LC_{50}:	**Inhalation, Rat**	**-**	64000 ppm

Carcinogenicity: CAS # 67-56-1: Not Listed by ACGIH, IARC, NIOSH, NTP, or OSHA

Teratogenicity: No

Reproductive Effects: Reported to cause birth defects in rats exposed to 20,000 ppm

Mutagenicity: Insufficient data.

SECTION 12 – ECOLOGICAL INFORMATION

Environmental
Methanol in fresh or salt water may have serious effects on aquatic life. A study in methanol's toxic effects on sewage sludge bacteria reported little effect on digestion at 0.1% while 0.5% methanol retarded digestion. Methanol will be broken down into carbon dioxide and water.

Mobility:
- Volatile organic compound (VOC): 100 %
- Soluble in water

Persistence and Degradability:

Biodegradation	BOD_5:	0.6 – 1.1 g O_2/g substance
	COD:	1.42 g O_2/g substance
Water:		Readily biodegradable in water (test: 99% OECD 301D. BOD 80% ThOD)

Methanol, when released into the air is expected to exist in the aerosol phase and will be degraded from the ambient atmosphere by the reaction with photochemically produced hydroxyl radicals with an estimated half life of 17.8 days. When released into the soil, methanol is expected to readily biodegrade and leach into groundwater. When released into water, it is expected to have a half life of between 1 and 10 days.

Other Adverse Effects:
- **Effects on the Ozone Layer:** Not harmful to the Ozone Layer (Council Regulation (EC) No**.** 3093 /94, O.J. L333 of 22/12/94).
- **Greenhouse Effect:** No data available.
- **Wastewater Purification:** Sludge digestion is inhibited at 800 mg/l. Nitrification of activated sludge is inhibited at 160 mg/l; 50%

SECTION 13 – DISPOSAL CONSIDERATIONS

Refer to Section 6 – *Waste Disposal*. It is also recommended that users review federal, state and governmental regulations prior to disposal. Store material for disposal as indicated in Section 7, *Handling & Storage.*

SECTION 14 – TRANSPORTATION INFORMATION

Classification of substance in compliance with UN Recommendations

- **UN-number:** 1230
- **Class:** 3
- **Sub-Risks:** 6.1
- **Packing Group:** II
- **Proper Shipping Name:** UN 1230, Methanol

ADR (Transportation by Road)

- **Class:** 3
- **Packing Group:** II
- **Danger Label Tanks:** 3+6.1
- **Danger Label Packages:** 3+6.1
- **Hazchem:** 2WE

RID (Transportation by Rail)

- **Class:** 3
- **Packing Group:** II
- **Danger Label Tanks:** 3+6.1
- **Danger Label Packages:** 3+6.1

ADNR (Transportation by Inland Waterways)

- **Class:** 3
- **Packing Group:** II
- **Danger Label Tanks:** 3+6.1
- **Danger Label Packages:** 3+6.1

IMDG (Maritime Transport)

- **Class:** 3
- **Sub-Risks:** 6.1
- **Packing Group:** II
- **MFAG:** 19 (IMDG suppl. 2002 p.40)
- **EMS:** F – E, S – D
- **Marine Pollutant:** -

ICAO (Air Transport)

- **Class:** 3
- **Sub-Risks:** 6.1
- **Packing:** II
- **Packing Instructions Passenger Aircraft:** 305 / Y305
- **Packing Instructions Cargo Aircraft:** 307

Limited Quantities (LQ):
When substance and their packaging meet the conditions established by ADR / RID / ADNR, only the following prescriptions shall be complied with:
Each package shall display a diamond-shaped figure with the following inscription: “UN 1230”.
Or in the case of different goods with different identification numbers within a single package: the letters “LQ”.

SECTION 15 – REGULATORY INFORMATION

The following selected regulatory requirements may apply to this product. Not all such requirements are identified. Users of this product are solely responsible for compliance with all applicable federal, provincial and local regulations.

CANADIAN REGULATIONS

WHMIS
- Class B-2: Flammable liquid with flash point lower than 37.8^{o}C (100 ^{o}F).
- Class D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).
- Class D-2A: Material causing other toxic effects (VERY TOXIC).
- Class D-2B: Material causing other toxic effects (TOXIC).

CEPA, Domestic Substances List Listed

US REGULATIONS

- TSCA (Toxic Substance Control Act) Listed
- CERCLA (Comprehensive Environmental Response Compensation and Liability Act of 1980), 40 CFR 302.4(a) Listed
- SARA (Superfund Amendment & Reauthorization Act) , 40 CFR 31 Listed
- OSHA Process Safety Management, 29 CFR 1910 Hazardous
- EPA Accidental Release Prevention, 40 CFR 116-117 Hazardous
- Clean Air Act: Material does not contain any Class 1 or Class 2 Ozone Depletors
- Clean Water Act:
  - None of the chemicals in this product are listed as Hazardous substances under the CWA
  - None of the chemicals in this product are listed as Toxic Pollutants under the CWA

EUROPEAN REGULATIONS
(European Labeling in Accordance with EC Directives)

Hazard Symbols	-	T F
Risk Phrases:		
R 11	-	Highly Flammable
R 23/24/25	-	Toxic by inhalation, in contact with skin and if ingested
R 39/23/24/25	-	Toxic. Danger of very serious irreversible effects through inhalation, in contact with skin and if ingested

SECTION 16 – ADDITIONAL INFORMATION

DISCLAIMER

The information and recommendations herein are taken from data contained in independent, industry-recognized references and is believed to be accurate and represents the best information currently available to us. Methanol Holdings (Trinidad) Limited makes no representation or warranties, either expressed or implied, including without limitation any warranties of merchantability, fitness for a particular purpose with respect to the information set forth herein or the product to which the information refers. Users should conduct their own investigations to determine the suitability of the information to their particular purpose. Accordingly, Methanol Holdings (Trinidad) Limited will not be responsible for loss or damages resulting from use of or reliance upon this information.

Prepared by: Methanol Holdings (Trinidad) Limited.

Date of Issue: August 2007

Celanese

Product name:	Methyl isobutyl carbinol
MSDS number:	63
Material number:	80063
Published date:	02/02/2006(V1)

MATERIAL SAFETY DATA SHEET

1. Product and Company Identification

Product: Methyl isobutyl carbinol
MSDS number: 63
Material number: 80063

Celanese Pte Ltd
111 Somerset Road
Singapore Power Building #02-02/03
Singapore 238164
Tel No: (65) 6733 1767

Transportation emergency phone numbers:
+ (65) 66639259 (Operations Room direct dial)
+ (65) 62656917 (Operations Room direct dial)
+ (65) 62650177(Switchboard, ask for Operations Room)

or fax request to
+(65) 62644190 (Facsimile to Operations Room)
+(65) 62664696 (Facsimile to Operations Room)

or email to
opsroom@semco.psa.com.sg

or Call CHEMTREC 703 527 3887 (USA), collect calls accepted
"+" = International Dialing Access Code

Product Use: Intermediate for lube oil additives, especially zinc dialkyl dithiophosphates; frothing agent for ore flotation, especially copper.

2. Composition / Information on Ingredients

Component	CAS Number	Percent %	OSHA hazard category:
METHYL ISOBUTYL CARBINOL	108-11-2	99	Hazardous

3. Hazards Identification

Celanese

Product name:	Methyl isobutyl carbinol
MSDS number:	63
Material number:	80063
Published date:	02/02/2006(V1)

Emergency Overview:

WARNING!
•Flammable liquid and vapor.
•May cause respiratory tract and eye irritation.
•May cause skin irritation.
•Prolonged or repeated contact may dry skin and cause irritation.
•Material creates a special hazard because it floats on water.

Product Description

Appearance:	Clear, colorless mobile liquid.
Odor:	Slightly irritating, alcohol odor.

Potential health effects

Routes of exposure: Skin, eyes, inhalation, ingestion.

Immediate effects:

Skin: May cause skin irritation. Prolonged or repeated contact may dry skin and cause irritation. May be harmful if absorbed through skin. Symptoms of exposure may include: Central nervous system depression with headache, stupor, uncoordinated or strange behavior or unconsciousness. Drying, cracking or inflammation of skin.

Eyes: Exposure to vapors and liquid Causes eye irritation. Symptoms of exposure may include: Eye irritation, burning sensation, pain, watering, and/or change of vision.

Inhalation: Causes respiratory tract irritation. Harmful if inhaled. Symptoms of exposure may include: Central nervous system depression with nausea, dizziness, headache, stupor, uncoordinated or strange behavior or unconsciousness. Nasal discharge, hoarseness, coughing, chest pain and breathing difficulty.

Ingestion: May be harmful if swallowed. Symptoms of exposure may include: Nausea, vomiting, loss of appetite, gastrointestinal irritation and/or diarrhea. Central nervous system depression with nausea, headache and mental sluggishness.

Mutagenic: Does not show mutatgenic potential in most in vitro tests.

Target organ effects: •Overexposure (prolonged or repeated exposure) may cause:
Kidney damage
Central nervous system depression
Injury to the eyes
Irritation of the respiratory tract
Irritation of the digestive tract
Drying of the skin

Product name:	Methyl isobutyl carbinol
MSDS number:	63
Material number:	80063
Published date:	02/02/2006(V1)

Medical conditions which may be aggravated by exposure: Significant exposure to this chemical may adversely affect people with acute or chronic disease of the:
Respiratory Tract
Skin
Eyes
Kidneys
Central nervous system
Digestive tract

For further information, see:
Section 4 - First Aid Measures
Section 5 - Fire Fighting Measures
Section 6 - Accidental Release Measures
Section 8 - Exposure Controls/Personal Protection
Section 9 - Physical and Chemical Properties
Section 10 - Stability and Reactivity

4. First Aid Measures

Skin: Immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Call a physician if irritation develops and persists. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes. If easy to do, remove contact lenses, if worn. Get medical attention immediately.

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion: DO NOT induce vomiting. Get medical attention immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person.

5. Fire Fighting Measures

NFPA: Health: 2 Flammability: 2 Reactivity: 0

Flammable properties

Flash point (test method): 42.4 C (108 F)

Flammable limits in air, % by volume:
Upper: 5.5 %
Lower: 1 %

Autoignition temperature: 360.3 C (680 F)

Products of combustion: Carbon Monoxide.

Extinguishing Media: Use CO_2 or dry chemical for small fires. Use aqueous film forming foam for large fires.

Fire Fighting Instructions: Water spray should be used to cool fire-exposed structures and vessels. Keep personnel removed from and upwind of fire. If potential for exposure to vapors or products of combustion exists, wear full fire fighting turnout gear and NIOSH approved self-contained breathing apparatus. Oxidizing chemicals may accelerate the burning rate in a fire situation.

Fire Fighting Environmental Concerns: Thoroughly decontaminate bunker gear and other fire-fighting equipment before re-use.

6. Accidental Release Measures

Spill or Leak Instructions Eliminate ignition sources. See Section 8 for appropriate personal protective equipment. Contain spill with dikes of soil or nonflammable absorbent to minimize contaminated area. If fire potential exists, blanket spill with alcohol type aqueous film-forming foam or use water fog stream to disperse vapors. Avoid run-off into storm sewers and ditches leading to waterways. If required, notify state and local authorities. Place leaking containers in well-ventilated area. Clean up small spills by using a nonflammable absorbent or flushing sparingly with water. Contain larger spills with nonflammable diking or absorbent. Clean up by vacuuming or sweeping.

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Isolate for 800 meters or 0.5 miles in all directions if tank, rail car, or tank truck in involved in fire. Material creates a special hazard because it floats on water. Assess the spill situation, as the spill may not evolve large amounts of hazardous airborne contaminants in many outdoor spill situations. It may be advisable in some cases to simply monitor the situation until spilled product is removed.

7. Handling and Storage

Handling: Use with adequate ventilation. Keep containers closed when not in use. Always open containers slowly to allow any excess pressure to vent. Avoid breathing vapor. Avoid contact with eyes, skin or clothing. Wash thoroughly with soap and water after handling. Decontaminate soiled clothing thoroughly before re-use. Destroy contaminated leather clothing.

This product may generate a static charge. Ground/bond equipment when transferring material to prevent static accumulation. Electrical equipment and circuits in all storage and handling must conform to requirements of National Electric Code (Article 500 and 501) for hazardous location.

Storage: Keep all containers tightly closed when not in use. Store out of direct sunlight and on an impermeable floor.
Do not store with incompatible materials. See Section 10. Stability and Reactivity.

8. Exposure Controls / Personal Protection

Engineering Controls: General or dilution ventilation is frequently insufficient as the sole means of controlling employee exposure. Local ventilation is usually preferred.

Protective Equipment A safety shower and eyebath should be readily available.

Skin protection: Wear impervious clothing and gloves to prevent contact. Butyl rubber is recommended. Other protective material may be used, depending on the situation, if adequate degradation and permeation data is available. If other chemicals are used in conjunction with this chemical, material selection should be based on protection for all chemicals present.

Eye/face protection: Wear chemical goggles when there is a reasonable chance of eye contact.

Respiratory protection: Based on workplace contaminant level and working limits of the respirator, use a respirator approved by NIOSH. The following is the minimum recommended equipment for an occupational exposure level. To estimate an occupational exposure level see Section 3, Section 8 and Section 11.

For concentrations > 1 and < 10 times the occupational exposure level: Use air-purifying respirator with full facepiece and organic vapor cartridge(s) or air-purifying full facepiece respirator with an organic vapor canister or a full facepiece powered air-purifying respirator fitted with organic vapor cartridge(s). The air purifying element must have an end of service life indicator, or a documented change out schedule must be established. Otherwise, use supplied air.

For concentrations more than 10 times the occupational exposure level and less than the lower of either 100 times the occupational exposure level or the IDLH: Use Type C full facepiece supplied-air respirator operated in positive-pressure or continuous-flow mode.

For concentrations > 100 times the occupational exposure level or greater than the IDLH level or unknown concentrations (such as in emergencies): Use self-contained breathing apparatus with full facepiece in positive-pressure mode or Type C positive-pressure full facepiece supplied-air respirator with an auxiliary positive-pressure self-contained breathing apparatus escape system.

For escape: Use self-contained breathing apparatus with full facepiece or any respirator specifically approved for escape.

Exposure guidelines

Product name:	Methyl isobutyl carbinol
MSDS number:	63
Material number:	80063
Published date:	02/02/2006(V1)

Component	CAS Number	Percent %	ACGIH TWA	ACGIH STEL	ACGIH CEILING	OSHA TWA	OSHA STEL	OSHA CEILING	Celanese WEL *	Mexico TWA	Mexico STEL	Mexico CEILING
METHYL ISOBUTYL CARBINOL	108-11-2	99	25 ppm	40 ppm	-	25 ppm	-	-	-	25 ppm	40 ppm	-

Component	CAS Number	Percent %	1990 NIOSH IDLH (Recognized by OSHA)	1994 NIOSH IDLH
METHYL ISOBUTYL CARBINOL	108-11-2	99	2000 PPM	400 ppm

Comments: Celanese has adopted the ACGIH TLVs
* Workplace Exposure Limit

9. Physical and Chemical Properties

Appearance: Clear, colorless mobile liquid.

Odor: Slightly irritating, alcohol odor.

Vapor Pressure: 4.7 mm Hg at 20 deg C

Vapor Density (Air=1 @ 20°C): 3.53

Boiling Point (760 mmHgA): 132 C (269.6 F)

Freezing Point: < -50 C (< -58 F)

Solubility in Water @ 20°C: 1.82 grams per 100 grams H2O

Specific Gravity: 0.808 at 20 deg C

Molecular Weight: 102.2

Evaporation Rate (n-Butyl acetate = 1): 0.26

10. Stability and Reactivity

Stability: Stable.

Conditions to Avoid: Avoid heat , flames, sparks, and other sources of ignition.

Incompatibility: Keep away from sulfuric and other strong inorganic acids, aluminum or lead (including equipment made of these metals), and oxidizing agents such as peroxides, nitric acid, perchloric acid or chromium trioxide.

Hazardous Combustion or Decomposition Products: Thermal decomposition products may include oxides of carbon.

Product name:	Methyl isobutyl carbinol
MSDS number:	63
Material number:	80063
Published date:	02/02/2006(V1)

Hazardous Polymerization: Hazardous polymerization will not occur.

11. Toxicological Information

Component Toxicological Information

Component	METHYL ISOBUTYL CARBINOL

Acute Exposure: Excessive exposure leads to depression of the central nervous system which is generally reversible and is shown by headache, dizziness, drowsiness, loss of coordination and unconsciousness.

Oral LD50: 2.6g-kg (rats); Slightly toxic to animals. Nausea, vomiting, gastrointestinal irritation and diarrhea may occur.

Inhalation LC50: >3776 ppm (rats; vapor; 4hrs.); Slightly toxic to animals. Vapors are irritating to the respiratory tract.

Skin: Repeated or prolonged contact may cause drying of the skin dermatitis. Moderately irritating to rabbit skin. Slightly toxic (dermal LD50, rabbit:2.9g/kg).

Eyes: Liquid causes moderate to severe irritation of rabbit eyes. Vapors are irritating to the eyes.

Mutagenicity: Not mutagenic in bacterial, yeast and rat liver cell in vitro assays, including the Ames Test.

Carcinogenicity: No information.

Reproductive/Developmental Effects: No information.

Other: Methyl isobutyl carbinol has potentiated the liver toxicity of halogenated solvents (e.g., chloroform and carbon tetrachloride) in experimental animals at oral doses of 570 mg/kg or higher.

Repeated Exposure: Male and female rates exposed for 6hr/day. 5 days/wk for 6 wks to 211. 825 or 3698 mg/m^3 showed no overt signs of toxicity, effects on blood parameters or compound-related effects based on gross and microscopic examination of tissues. Increased kidney weight was observed in the males at the high dose. Effects on urine parameters were noted at all dose levels except for the low dose males. There are several other studies of limited quality and with limited details. In a 90-day inhalation study, kidney effects were reported in rats at 0.425 mg/1, but not in monkeys or dogs. The effect in rats was reversible on cessation of exposure. In mice exposed 12 times for 4 hours to vapor saturated air (approximately 20 mg/1), an anesthetic effect was reported, but no mortality. In rabbits exposed dermally 5 times over a period of 15-21 days at 2.5 g/kg, no systemic effects were observed.

12. Ecological Information

Component Ecological Information

Component	METHYL ISOBUTYL CARBINOL

Ecotoxicity: Methyl isobutyl carbinol exhibits low acute toxicity to aquatic species. The 96-hour LC50 for fish (Pimephales promelas) was greater than 92.4 ppm. There was no mortality at this level. The 24-hour LC50 value for fish (Carassius auratus) is 360 ppm. The 24-hour LC50 value for shrimp (Artemia salina) is 370 ppm. The 48-hour LC50 value for the clawed toad (Xenopus laevis) is 656 ppm. The 3-hour EC50 for inhibition of bacteria was greater than 100 ppm in the Activated Sludge Respiration Inhibition Test.

13. Disposal Considerations

Dispose of spilled material in accordance with state and local regulations for hazardous waste. Recommended methods are incineration or biological treatment at a federally or state-permitted disposal facility. Note that this information applies to the material as manufactured; processing, use, or contamination may make this information inappropriate, inaccurate, or incomplete.

Note that this handling and disposal information may also apply to empty containers, liners and rinsate. State or local regulations or restrictions are complex and may differ from federal regulations. This information is intended as an aid to proper handling and disposal; the final responsibility for handling and disposal is with the owner of the waste. See Section 9 - Physical and Chemical Properties.

EPA Hazardous Waste Code(s): D001

14. Transport Information

US Department of Transportation:

UN/NA Number:	UN 2053
Shipping name:	METHYL ISOBUTYL CARBINOL
Hazard class:	3
Packing Group:	PG III
Emergency Response Guide:	129

ICAO/IATA:

IATA UN Number:	UN 2053
Proper Shipping Name:	METHYL ISOBUTYL CARBINOL
Hazard Classification:	3
Packing group:	III
Label:	(Flammable Liquid)

IMDG:

International Marine UN Number:	UN 2053
Proper Shipping Name:	METHYL ISOBUTYL CARBINOL
Hazard Class:	3
Packing Group:	III
Flash point (test method):	42.4 C (108 F)

Transport Canada

Product name:	Methyl isobutyl carbinol
MSDS number:	63
Material number:	80063
Published date:	02/02/2006(V1)

Trade Information
Schedule B Code (export): 2905.19.0020

15. Regulatory Information

Hazard labeling:

In accordance with EC Directives

R phrases
R 10 Flammable.
R 37 Irritating to respiratory system.

S phrase combination
S 24/25 Avoid contact with skin and eyes.

INTERNATIONAL REGULATIONS
International Chemical Inventory

Listed on the chemical inventories of the following countries or qualifies for an exemption:
AUSTRALIA,CHINA,CANADA,EUROPE,KOREA,PHILIPPINES, JAPAN

16. Other Information

Prepared by:	Product Stewardship Department Celanese Ltd.
Hazard ratings	This information is intended solely for the use of individuals trained in the NFPA and/or HMIS systems.
NFPA:	Health: 2 Flammability: 2 Reactivity: 0
HMIS:	Health: 2 Flammability: 2 Reactivity: 0
Revisions:	The following sections have been revised since the last issue of this MSDS.

1. Product and Company Identification

Celanese

Product name:	Methyl isobutyl carbinol
MSDS number:	63
Material number:	80063
Published date:	02/02/2006(V1)

For industrial use only. The information contained herein is accurate to the best of our knowledge. We do not suggest or guarantee that any hazards listed herein are the only ones which exist. Celanese makes no warranty of any kind, express or implied, concerning the safe use of this material in your process or in combination with other substances. Effects can be aggravated by other materials and/or this material may aggravate or add to the effects of other materials. This material may be released from gas, liquid, or solid materials made directly or indirectly from it. User has the sole responsibility to determine the suitability of the materials for any use and the manner of use contemplated. User must meet all applicable safety and health standards. Material safety data sheets are provided on the Internet by Celanese as a service to its customers. Possession of an Internet MSDS does not indicate that the possessor of the MSDS was a purchaser or user of the subject product.

Quadra Material Safety Data Sheet

Validated and verified by: Regulatory Affairs / Affaires réglementaires **Validation date 10/3/2007.**

WHMIS

Protective Clothing

TDG Road / Rail

Section 1. Chemical product and company identification

Sodium isobutyl xanthate 90%

Code : Q02762

Synonym : Not available.

Manufacturer : Qixia Tongda Flotation Reagent Co. Ltd

Supplier : QUADRA CHEMICALS LTD.
370, boul. Joseph-Carrier
Vaudreuil-Dorion QC J7V 5V5
Tel: (450) 424-0161

Burlington ON Tel: (905) 336-9133
Delta BC Tel: (604) 940-2313
Edmonton AB Tel: (780) 451-9222
Calgary AB Tel: (403) 232-8130

Material uses : Industrial applications: Flotation agent.

TRANSPORTATION EMERGENCY - 24HRS/DAY - 7 DAYS/WEEK
IN CANADA - CALL 1-800-567-7455

Section 2. Composition, Information on Ingredients

Name	CAS #	% by weight	Exposure limits
sodium isobutyl xanthate	25306-75-6	60-100	Not available.
carbonotrithioic acid, disodium salt	534-18-9	1-5	Not available.
sodium carbonate	497-19-8	0.5-1.5	Not available.
disodium sulfide	1313-82-2	0.5-1.5	Not available.

Consult local authorities for acceptable exposure limits.

Section 3. Hazards identification

Emergency overview PYROPHORIC MATERIAL.
CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION.
HARMFUL IF SWALLOWED.

Routes of entry : Inhalation. Ingestion.

Potential acute health effects

Eyes : Dust and vapours cause eye irritation.

Skin : Repeated contact with dust causes irritation to the skin.

Inhalation : Inhalation of the dust will irritate the nose and throat and cause coughing and chest discomfort. Carbon disulphide (CS_2) vapours are rapidly absorbed and may cause headache, nausea and dizziness followed by vomiting, blurred vision, respiratory depression and unconsciousness.

Ingestion : Will cause vomiting, headache, convulsions and unconsciousness.

Continued on next page

Potential chronic health effects : **CARCINOGENIC EFFECTS** Not available.
MUTAGENIC EFFECTS Not available.
TERATOGENIC EFFECTS Not available.
DEVELOPMENTAL TOXICITY Not available.

Medical conditions aggravated by overexposure : No additional information.

Over-exposure signs/symptoms : No additional information.

See toxicological Information (section 11)

Section 4. First aid measures

Eye Contact : IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. COLD water may be used. Seek immediate medical attention.

Skin Contact : Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Seek immediate medical attention.

Inhalation : Allow the victim to rest in a well ventilated area. If breathing is difficult, administer oxygen. If the victim is not breathing, perform artificial respiration. Seek immediate medical attention.

Ingestion : DO NOT induce vomiting. If the victim is conscious, give a little water or milk. NEVER give an unconscious person anything to ingest. Seek immediate medical attention.

Notes to Physician : No additional information.

Section 5. Fire fighting measures

Flammability of the product : Spontaneously combustible.

Auto-ignition Temperature : 100°C (212°F) (carbon disulphide)

Flash Points : Not available.

Flammable limits : Not available.

Products of combustion : Exposure to heat and moisture may cause the decomposition of the isobutyl xanthate to flammable and explosive vapours of carbon disulphide.

Fire hazards in presence of various substances : Flammable in presence of open flames, sparks and static discharge, of heat.

Explosion hazards in presence of various substances : Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.
Dust can combine with air to form an explosive mixture.

Fire fighting media and instructions : Use DRY chemicals, carbon dioxide or alcohol-resistant foam. Do not use water. Wear NIOSH approved self-contained breathing apparatus (SCBA) when either in confined areas or exposed to combustion products.

Section 6. Accidental release measures

Spill or leak : Use appropriate tools to put the spilled material in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to federal, provincial and municipal environmental control regulations.

Section 7. Handling and storage

Handling : Follow routine safe handling procedures.

Storage : Keep container tightly closed. Keep in a cool, well ventilated place. Avoid dust generation. Store away from incompatible materials. Avoid all possible sources of ignition (spark or flame). Protect from humidity.

Section 8. Exposure Controls, Personal Protection

Engineering controls : Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapours below their respective threshold limit value. Ensure that eye stations and safety showers are proximal to the work-station location.

Personal protection

Eyes : Splash goggles or faceshield.

Body : Full suit. Rubber apron.

Continued on next page

Respiratory : If user operations generate dust, fume, mist or if workplace contaminant level is above threshold limit, ensure to use a MSHA/NIOSH approved respirator or equivalent.

Hands : Chemical resistant gloves.

Feet Chemical resistant boots.

Section 9. Physical and chemical properties

Physical State and Appearance : Solid. (Pellets.)

Color : Yellow to green.

Odor : Disagreeable sulphur-type. (Slight.)

Melting/freezing point : 229 to 253°C (444.2 to 487.4°F)

Specific Gravity : 0.8 to 0.825 (Water = 1)

Volatility : 0% (v/v)

Evaporation rate : <1 compared to (butyl acetate = 1)

Solubility : Soluble in water: 11.2 g/100 ml @ 0°C; 33.4 g/100 ml @ 35°C

Section 10. Stability and reactivity

Stability and Reactivity : Stable under normal conditions.

Conditions of instability : Avoid elevated temperatures and moisture.

Incompatibility with various substances : Reactive with oxidizing agents, acids.
Do not apply steam to the material.

Hazardous Decomposition Products : May liberate carbon disulphide, isobutyl alcohol, oxides of carbon and sulphur.

Hazardous polymerization : Will not occur.

Section 11. Toxicological information

Toxicity data : Acute oral toxicity (LD50): 500 to 2000 mg/kg [Rat]. (sodium isobutyl xanthate).

Chronic effects on humans : No additional information.

Other toxic effects on humans : No additional information.

Remarks on toxicity to animals : No additional information.

Section 12. Ecological information

Ecotoxicity data : May be harmful to aquatic life.

Remarks on the products of biodegradation : No additional remark.

Section 13. Disposal considerations

Waste information : Waste and empty packaging must be disposed of in accordance with federal, provincial, and municipal environmental control regulations.

Waste stream : Avoid entry of product into the sewage system or water streams.

Consult your local or regional authorities.

Section 14. Transport information

Regulatory Information	Shipping name and Class	UN number	Packing group
TDG Classification	XANTHATES Class 4.2	3342	III

Continued on next page

Section 15. Regulatory information

WHMIS (Canada) : PYROPHORIC CHEMICAL. CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION. HARMFUL IF SWALLOWED.
Class B-6, D-1B, D-2B.

DSL (CEPA) : CEPA DSL: All ingredients are listed or exempted.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations.

Section 16. Other information

References : Canadian Guide of the Law and Regulations of the Transportation of the Dangerous Goods. Controlled products regulations. Manufacturer's Material Safety Data Sheet.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

Other special considerations : No additional remark.

Regulatory Affairs Department : (450) 424-0161

EXPLOSIVES COMPONENTS

SAFETY DATA SHEET

Ammonium Nitrate, Mini-Prill

Section 1. Identification

Product identifier : Ammonium Nitrate, Mini-Prill

Other means of identification : Product code: 2499-12958
Historic MSDS #:12958

Product type : Solid.

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

Identified uses
Industrial use for the formulation of preparations, intermediate use, and end use in industrial settings. Professional use in formulation of preparations and end-use.

Uses advised against	Reason
Consumer use. Restricted to professional users.	U.S.and Canadian Federal regulations

Supplier's details : Agrium Wholesale
13131 Lake Fraser Drive, S.E.
Calgary, Alberta, Canada, T2J 7E8

Agrium U.S. Inc.
Suite 1700, 4582 South Ulster St.
Denver, Colorado, U.S.A., 80237

Company phone number (North America):
1-800-403-2861 (Customer Service)

Emergency telephone number (with hours of operation) : Agrium 24 Hr Emergency Telephone Numbers:
English:
Transportation Emergencies: 1-800-792-8311
Medical Emergencies: 1-303-389-1653

French or Spanish:
Tranportation or Medical Emergencies: 1-303-389-1654

Section 2. Hazard identification

Classification of the substance or mixture : OXIDIZING SOLIDS - Category 3
EYE IRRITATION - Category 2A

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

GHS label elements

Hazard pictograms :

Signal word : Warning

Hazard statements : May intensify fire; oxidizer.
Causes serious eye irritation.

Precautionary statements

General : Not applicable.

Prevention : Wear protective gloves. Wear eye or face protection. Wear protective clothing. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Keep away from clothing and other combustible materials. Wash hands thoroughly after handling.

Section 2. Hazard identification

Response : IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.

Storage : Not applicable.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements : None known.

Other hazards which do not result in classification : Explosion risk in case of fire. Risk of explosion if heated under confinement. Risk of vigorous reaction, ignition and explosion in contact with combustible or flammable substances.

Section 3. Composition/information on ingredients

Substance/mixture : Multi-constituent substance

Ingredient name	% (w/w)	CAS number
Ammonium nitrate	99.5	6484-52-2

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First-aid measures

Description of necessary first aid measures

Eye contact : Begin eye irrigation immediately. Eye exposures to nitrates may require medical evaluation following decontamination if pain or irritation persists. Immediately rinse eyes with large quantities of water or saline for a minimum of 15 minutes. If possible, remove contact lenses being careful not to cause additional eye damage. If the initial water supply is insufficient, keep the affected area wet with a moist cloth and transfer the person to the nearest place where rinsing can be continued for the recommended length of time. For additional advice call the medical emergency number on this SDS or your poison center or doctor.

Inhalation : Remove person to fresh air. No known significant effects. Seek medical attention for any signs of wheezing and/or breathing difficulties. For additional advice call the medical emergency number on this SDS or your poison center or medical provider.

Skin contact : No known significant effects. Rinse the affected areas with water. Remove contaminated clothing, jewelry, and shoes. Wash/clean items before reuse. Seek medical attention for persistent skin pain or irritation. For additional advice call the medical emergency number on this SDS or your poison center or doctor.

Ingestion : Ammonium nitrate-based fertilizer. May be irritating to mouth, throat and stomach. May cause methemoglobinemia (a condition that interferes with the oxygen-carrying capacity of the blood) if ingested in large quantities or over a prolonged period of time. Oral exposures: if the affected person requires CPR, avoid mouth to mouth contact. Do not induce vomiting. If vomiting occurs, attempt to keep head lower than chest so that vomit does not enter the lungs. Wash (decontaminate) face and mouth with water to remove visible material. If the exposed person is conscious and can swallow, give 1-2 sips of water. Do not give anything else by mouth. Loosen tight clothing such as collar, tie, belt or waistband to prevent any breathing restrictions. Call for emergency transportation to a hospital if the exposed person feels sick or has breathing difficulties, or a large amount is suspected ingested. For additional advice, call the medical emergency number on this SDS or your poison center or doctor.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye irritation.

Section 4. First-aid measures

Inhalation : No known significant effects or critical hazards. Persons with asthma may be more sensitive.

Skin contact : No known significant effects or critical hazards.

Ingestion : May be irritating to the digestive tract. May cause nausea, vomiting, diarrhea, and abdominal pain. May cause methemoglobinemia (a condition that interferes with the oxygen-carrying capacity of the blood) if ingested in large quantities or over a prolonged period of time. Persons with methemoglobinemia may have blue tinge color to lips, nails, and skin. Also they may have shortness of breath or trouble breathing. Persons more susceptible to methemoglobinemia include: very young (less than 3 months), the elderly, those with chronic obstructive pulmonary disease (COPD), anemia, coronary artery disease, recent surgery or infection, and those with a genetic deficiency of G-6-PD.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : The substance will not burn. Undergoes thermal decomposition at elevated temperatures to release toxic and flammable gases. Decomposition products may include the following materials:
Ammonia
nitrogen oxides

Adverse symptoms may include the following:
headache
respiratory tract irritation
coughing

Skin contact : No specific data is available about overexposure under normal working conditions.

Ingestion : Over-exposure by ingestion is unlikely under normal working conditions. Adverse symptoms may include the following:
nausea or vomiting
stomach pains
diarrhea
Methemoglobinemia (see Acute Health Effects)

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : In case of inhalation of decomposition products (carbon monoxide, carbon dioxide, nitrogen oxides) in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for up to 72 hours. In cases of suspected methemoglobinemia, monitor methemoglobin blood levels. Treatment is supportive; methylene blue may be indicated based on patient severity. 24 Hr Medical Emergency telephone number for professional support: English: 1-303-389-1653; French or Spanish: 1-303-389-1654.

Specific treatments : Call the medical emergency number on this SDS or your poison center or doctor immediately if large quantities have been ingested. In cases of suspected methemoglobinemia, methylene blue may be indicated based on patient severity.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. Mouth-to-mouth resuscitation of oral exposure patients is not recommended. First-aiders with contaminated clothing should be properly decontaminated.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Product with the capacity to undergo self-sustaining and progressive thermal decomposition. The product acts as an oxidizing agent, and supports combustion by liberating oxygen even if smothered. Evacuate area and fight fire remotely due to the risk of explosion. Use flooding quantities of water.

Unsuitable extinguishing media : Do not attempt to smother the fire. The product acts as an oxidizing agent, and supports combustion by liberating oxygen even if smothered. Do not use CO2, dry chemicals, foam, or water fog.

Specific hazards arising from the chemical : May intensify fire; oxidizer. Molten ammonium nitrate presents an elevated risk of explosion if heated under confinement, if impacted by falling debris, or if contaminated by incompatible substances or organic matter including wood, asphalt, or other structural construction materials.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
nitrogen oxides
Ammonia

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons at least 800 meters (1/2 mile) from the vicinity of the incident if there is a fire. Assign emergency response personnel to guard the exclusion perimeter in all directions from the incident site.

If responding to a fire and the structure or vehicle is significantly involved, set up and use unmanned hose holders or monitor nozzles. Emergency responders should control remote firefighting apparatus from a location offering protection against possible explosion. Maintain the maximum possible distance from the fire consistent with the use of fire-fighting equipment. Apply flooding quantities of water to the ammonium nitrate until the fire is out, to cool the product and reduce risk of deflagration.

If safe to do so, ventilate the structure to minimize heat and pressure. Move containers from fire area if this can be done without risk. If safe firefighting is impossible, withdraw from area and let the fire burn.

Refer to the NFPA 400 Hazardous Materials Code Annex E for further information on the safe handling of ammonium nitrate and suggested firefighting procedures.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Remark : Contain and collect the water used to fight the fire for later treatment and disposal.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Provide adequate ventilation. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Section 6. Accidental release measures

Small spill : Use suitable protective equipment (section 8). Move containers from spill area. Avoid dust generation. Use appropriate equipment to put the spilled substance in a container for reuse or disposal. Place spilled material in a designated, labeled waste container. Dispose of via a licensed waste disposal contractor.

Large spill : Put on appropriate personal protective equipment (see Section 8). Move containers from spill area. Prevent entry into sewers, water courses, basements or confined areas. Use appropriate equipment to put the spilled substance in a container for reuse or disposal. Avoid dust generation. Do not dry sweep. Recycle to process, if possible.
or
Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Do not ingest. Avoid contact with eyes, skin and clothing. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Keep away from clothing, incompatible materials and combustible materials. Keep away from heat. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. May form steep piles that can collapse without warning when stored in bulk. Avoid forming steep slopes when removing product. Ensure that bulk bags or smaller packaged products stored in tiers are stacked, racked, blocked, interlocked, or otherwise secured to prevent sliding, rolling, or collapse. Use caution when opening truck or railcar doors as product may have shifted during transport.

Must be stored in a dry location. Absorbs moisture on long-term storage under high humidity conditions. Store away from incompatible materials (see Section 10). When product is stored in sealable containers, keep container tightly closed and sealed until ready for use. Sealable containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Ensure compliance with OSHA 29CFR1910.109 requirements.

Separate from reducing agents and combustible materials. Use appropriate containment to avoid environmental contamination. Refer to NFPA 400 Hazardous Materials Code for further information on the safe storage and handling of hazardous materials.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Canadian Regulations: Ammonium nitrate	**Alberta TWA:** 10 mg/m3 Inhalable, 3 mg/m3 Respirable, for Particles Not Otherwise Regulated.

Section 8. Exposure controls/personal protection

U.S. Federal Regulations: Ammonium nitrate	**OSHA (United States):** Particulates not otherwise regulated (PNOR) TWA (8 hours), Total dust: 15 mg/m³; Respirable fraction: 5 mg/m³.

Appropriate engineering controls : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: sealed eyewear

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Recommended: disposable overall

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Use a properly fitted, particulate filter respirator complying with an approved standard if a risk assessment indicates this is necessary. For U.S. work sites where respiratory protection is required, ensure that a respiratory protection program meeting 29 CFR 1910.134 requirements is in place.

Section 9. Physical and chemical properties

Appearance

Physical state : Granular solid.

Color : Off-white.

Odor : Odorless.

Odor threshold : Not available.

pH : Not available.

Melting point : 169.6°C (337.3°F)

Boiling point : Decomposition temperature: >210°C (>410°F)

Flash point : Not applicable.

Burning time : Not applicable. Decomposes.

Evaporation rate : Not applicable.

Flammability (solid, gas) : Non-flammable.

Lower and upper explosive (flammable) limits : Not applicable. Inorganic salt.

Section 9. Physical and chemical properties

Vapor pressure : Not available.

Vapor density : Not available.

Relative density : No results available.

Solubility : Easily soluble in the following materials: hot water.
Soluble in the following materials: cold water.

Solubility in water : 1900 g/l

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : Not available.

Decomposition temperature : >210°C (>410°F)

Viscosity : Not available.

Section 10. Stability and reactivity

Reactivity : The pure product is stable at normal storage temperatures and pressures. May react explosively when mixed with chlorinated materials such as hypochlorites. May react explosively even in the absence of air at elevated pressure and/or temperature. Reactive or incompatible with the following materials:
Flammable material
Combustible material.
Metal powder.
Metal salt.
halogenated compounds
acids
alkalis

Chemical stability : The pure product is stable at normal storage temperatures and pressures.

Possibility of hazardous reactions : Hazardous reactions or instability may occur under certain conditions of storage or use. Conditions may include the following:
Contact with incompatible materials, such as acids, alkalis, heavy metal compounds and reducing agents, will result in hazardous decomposition.
contact with combustible materials
fire or heat

Reactions may include the following:
risk of causing or intensifying fire
hazardous decomposition
pressure build-up
risk of explosion with or without contact with air

Conditions to avoid : Prevent product contamination. Avoid contamination by any source including metals, dust and organic materials. Avoid high temperatures in combination with high pressures.

Incompatible materials : See above

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Ammonium nitrate	LD50 Oral LD50 Oral	Rat Rat - Male, Female	2217 mg/kg 2950 mg/kg	- -
-	LD50 Dermal	Rat - Male, Female	>5000 mg/kg	-

Conclusion/Summary : Not available. Very low toxicity to humans or animals.

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Ammonium nitrate	Skin Eyes - Edema of the conjunctivae	Rabbit Rabbit	0 3	- -	72 hours 3 days

Conclusion/Summary

Skin : Non-irritating to the skin.

Eyes : Irritating to the eyes.

Sensitization

Product/ingredient name	Route of exposure	Species	Result
Ammonium nitrate	skin	Mouse	Not sensitizing

Conclusion/Summary

Skin : Non-sensitizer.

Respiratory : Non-sensitizer.

Mutagenicity

Product/ingredient name	Test	Experiment	Result
Ammonium nitrate	OECD 471 Bacterial Reverse Mutation Test OECD 476 *In vitro* Mammalian Cell Gene Mutation Test	Experiment: In vitro Subject: Bacteria Experiment: In vitro Subject: Mammalian-Animal	Negative Negative

Conclusion/Summary : No mutagenic effect.

Carcinogenicity

Not available.

Conclusion/Summary : Not available. Potential for nitrosamine formation if ingested. Do not ingest.

Reproductive toxicity

Product/ingredient name	Maternal toxicity	Fertility	Development toxin	Species	Dose	Exposure
Ammonium nitrate	Negative	Negative	Negative	Rat - Male, Female	Oral: 1500 mg/kg	53 days; 7 days per week

Conclusion/Summary : Not considered to be toxic to the reproductive system.

Teratogenicity

Product/ingredient name	Result	Species	Dose	Exposure
Ammonium nitrate	Negative - Oral	Rat - Female	1500 mg/kg	53 days

Conclusion/Summary : No known significant effects or critical hazards.

Specific target organ toxicity (single exposure)

Not available.

Section 11. Toxicological information

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : No known significant effects or critical hazards. Persons with asthma may be more sensitive.

Skin contact : No known significant effects or critical hazards.

Ingestion : May be irritating to the digestive tract. May cause nausea, vomiting, diarrhea, and abdominal pain. May cause methemoglobinemia (a condition that interferes with the oxygen-carrying capacity of the blood) if ingested in large quantities or over a prolonged period of time. Persons with methemoglobinemia may have blue tinge color to lips, nails, and skin. Also they may have shortness of breath or trouble breathing. Persons more susceptible to methemoglobinemia include: very young (less than 3 months), the elderly, those with chronic obstructive pulmonary disease (COPD), anemia, coronary artery disease, recent surgery or infection, and those with a genetic deficiency of G-6-PD.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : The substance will not burn. Undergoes thermal decomposition at elevated temperatures to release toxic and flammable gases. Decomposition products may include the following materials:
Ammonia
nitrogen oxides

Adverse symptoms may include the following:
headache
respiratory tract irritation
coughing

Skin contact : No specific data is available about overexposure under normal working conditions.

Ingestion : Over-exposure by ingestion is unlikely under normal working conditions. Adverse symptoms may include the following:
nausea or vomiting
stomach pains
diarrhea
Methemoglobinemia (see Acute Health Effects)

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Eye irritation
Infant-methemoglobinemia

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Section 11. Toxicological information

Potential chronic health effects

General : No known significant effects or critical hazards.

Carcinogenicity : Potential for nitrosamine formation if ingested. Do not ingest.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Ammonium nitrate -	Chronic NOEC 6 to 12 mg/l Fresh water NOEC >1700 mg/l Marine water Acute EC50 490 mg/l Fresh water Acute LC50 447 mg/l Fresh water	Crustaceans - Cladocera Algae Daphnia Fish	21 days 10 days 48 hours 48 hours

Conclusion/Summary : Very low acute toxicity to fish. Practically non-toxic to aquatic organisms.

Persistence and degradability

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
Ammonium nitrate	-	-	Readily

Bioaccumulative potential

Not available.

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not applicable. Inorganic salt. Bioaccumulative potential - low

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	TDG Classification	DOT Classification	Mexico Classification	IMDG	IATA
UN number	1942	1942	1942	1942	1942
UN proper shipping name	Ammonium nitrate, with not more than 0.2 per cent combustible substances, including any organic substance calculated as carbon, to the exclusion of any other added substance (ammonium nitrate, solid)	Ammonium nitrate, with not more than 0.2 per cent combustible substances, including any organic substance calculated as carbon, to the exclusion of any other added substance (ammonium nitrate, solid)	Ammonium nitrate, with not more than 0.2 per cent combustible substances, including any organic substance calculated as carbon, to the exclusion of any other added substance solid	Ammonium nitrate, with not more than 0.2 per cent combustible substances, including any organic substance calculated as carbon, to the exclusion of any other added substance	Ammonium nitrate, with not more than 0.2 per cent combustible substances, including any organic substance calculated as carbon, to the exclusion of any other added substance
Transport hazard class(es)	5.1 	5.1 	5.1 	5.1 	5.1 
Packing group	III	III	III	III	III
Environmental hazards	No.	No.	No.	No.	No.
Additional information	**Explosive Limit and Limited Quantity Index** 5 **Passenger Carrying Road or Rail Index** 25 **Special provisions** Special Provisions re TDG: 37 Classification per the current revision, Transportation of Dangerous Goods Regulation, Part 2, Sec 2.3.	**Packaging instruction** **Passenger aircraft** Quantity limitation: 25 kg **Cargo aircraft** Quantity limitation: 100 kg **Special provisions** A1, A29, B120, IB8, IP3, T1, TP33 Classification per the current revision, Transportation of Dangerous Goods Regulation, Part 2, Sec 2.3.	-	**Emergency schedules (EmS)** F-H, S-Q	**Passenger and Cargo Aircraft** Quantity limitation: 25 kg Packaging instructions: 516 **Cargo Aircraft Only**Quantity limitation: 100 kg Packaging instructions: 518 **Limited Quantities - Passenger Aircraft**Quantity limitation: 10 kg Packaging instructions: Y516

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Section 14. Transport information

Transport in bulk according to Annex II of MARPOL and the IBC Code

Section 15. Regulatory information

Canadian lists

Canadian NPRI : The following components are listed: Total of ammonia (NH3 — CAS RN 7664-41-7) and the ammonium ion (NH4+ — CAS RN 14798-03-9) in solution, expressed as ammonia.

CEPA Toxic substances : None of the components are listed.

Canada inventory : All components are listed or exempted.

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol (Annexes A, B, C, E)

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Inform Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia : All components are listed or exempted.

China : All components are listed or exempted.

Europe : This material is listed or exempted.

Japan : All components are listed or exempted.

Malaysia : All components are listed or exempted.

New Zealand : All components are listed or exempted.

Philippines : All components are listed or exempted.

Republic of Korea : All components are listed or exempted.

Taiwan : All components are listed or exempted.

Turkey : Not determined.

U.S. Federal Regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined
TSCA 8(b) inventory:: All components are listed or exempted.

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304 Composition/information on ingredients

SARA 304 RQ : Not applicable.

Section 15. Regulatory information

SARA 311/312

Classification : Fire hazard
Immediate (acute) health hazard

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Ammonium nitrate	99.5	Yes.	No.	No.	Yes.	No.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	Ammonium nitrate	6484-52-2	100
Supplier notification	Ammonium nitrate	6484-52-2	100

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts : The following components are listed: Ammonium nitrate

New York : None of the components are listed.

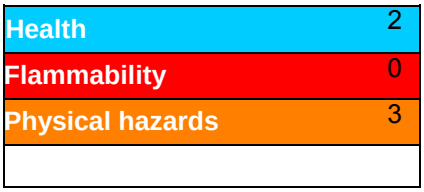
New Jersey : The following components are listed: Ammonium nitrate; Nitric acid, ammonium salt

Pennsylvania : The following components are listed: Nitric acid, ammonium salt

California Prop. 65 : Not listed.

Section 16. Other information

Hazardous Material Information System (U.S.A.)



Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings are not required on SDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA).

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)

History

Date of printing : 7/4/2016

Date of issue/Date of revision : 7/4/2016

Section 16. Other information

Date of previous issue : 2/10/2016

Version : 2.1

Indicates information that has changed from previously issued version.

This Safety Data Sheet has been revised to comply with Hazcom 2012 and WHMIS 2015 requirements.

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations
HPR = Hazardous Products Regulations

Procedure used to derive the classification

Classification	Justification
OXIDIZING SOLIDS - Category 3 EYE IRRITATION - Category 2A	Expert judgment On basis of test data

References : Transportation of Dangerous Goods Act and Clear Language Regulations, current edition at time of (M)SDS preparation, Transport Canada;
Hazardous Products Act and Regulations, current revision at time of (M)SDS preparation, Health Canada;
Domestic Substances List, current revision at time of (M)SDS preparation, Environment Canada;
29 CFR Part 1910, current revision at time of SDS preparation, U.S. Occupational Safety and Health Administration;
40 CFR Parts 1-799, current revision at time of SDS preparation, U.S. Environmental Protection Agency;
49 CFR Parts 1-199, current revision at time of SDS preparation, U.S. Department of Transport;
Threshold Limit Values for Chemical Substances, current edition at time of SDS preparation, American Conference of Governmental Industrial Hygienists;
NFPA 400, National Fire Codes, National Fire Protection Association, current edition at time of SDS preparation;
NFPA 704, National Fire Codes, National Fire Protection Association, current edition at time of SDS preparation;
Corrosion Data Survey, Sixth Edition, 1985, National Association of Corrosion Engineers;
ERG 2012, Emergency Response Guidebook, U.S. Department of Transport, Transport Canada, and the Secretariat of Transportation and Communications of Mexico
Hazardous Substances Data Bank, current revision at time of SDS preparation, National Library of Medicine, Bethesda, Maryland
Integrated Risk Information System, current revision at time of SDS preparation, U. S. Environmental Protection Agency, Washington, D.C.
Pocket Guide to Chemical Hazards, current revision at time of SDS preparation, National Institute for Occupational Safety and Health, Cincinnati, Ohio ;
Agency for Toxic Substances and Disease Registry Databank, current revision at time of SDS preparation, U.S. Department of Health and Human Services, Atlanta, Georgia
National Toxicology Program, Report on Carcinogens, Division of the National Institute of Environmental Health Sciences, Research Triangle Park, North Carolina.
Registry of Toxic Effects of Chemical Substances. National Institute for Occupational Safety and Health, Cincinnati, Ohio
The Fertilizer Institute, Product Toxicology Testing Program Results, TFI, Washington , D.C., 2003

Notice to reader

Section 16. Other information

DISCLAIMER AND LIMITATION OF LIABILITY

The information and recommendations contained in this Safety Data Sheet ("SDS") relate only to the specific material referred to herein (the "Material") and do not relate to the use of such Material in combination with any other material or process. The information and recommendations contained herein are believed to be current and correct as of the date of this SDS. HOWEVER, THE INFORMATION AND RECOMMENDATIONS ARE PRESENTED WITHOUT WARRANTY, REPRESENTATION OR LICENSE OF ANY KIND, EXPRESS OR IMPLIED, WITH RESPECT TO THEIR ACCURACY, CORRECTNESS OR COMPLETENESS, AND THE SELLER, SUPPLIER AND MANUFACTURER OF THE MATERIAL AND THEIR RESPECTIVE AFFILIATES (COLLECTIVELY, THE "SUPPLIER") DISCLAIM ALL LIABILITY FOR RELIANCE ON SUCH INFORMATION AND RECOMMENDATIONS. This SDS is not a guarantee of safety. A buyer or user of the Material (a "Recipient") is responsible for ensuring that it has all current information necessary to safely use the Material for its specific purpose.

FURTHERMORE, THE RECIPIENT ASSUMES ALL RISK IN CONNECTION WITH THE USE OF THE MATERIAL. THE RECIPIENT ASSUMES ALL RESPONSIBILITY FOR ENSURING THE MATERIAL IS USED IN A SAFE MANNER IN COMPLIANCE WITH APPLICABLE ENVIRONMENTAL, HEALTH, SAFETY AND SECURITY LAWS, POLICIES AND GUIDELINES. THE SUPPLIER DOES NOT WARRANT THE MERCHANTABILITY OF THE MATERIAL OR THE FITNESS OF THE MATERIAL FOR ANY PARTICULAR USE AND ASSUMES NO RESPONSIBILITY FOR INJURY OR DAMAGE CAUSED DIRECTLY OR INDIRECTLY BY OR RELATED TO THE USE OF THE MATERIAL.

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

1.1. Product identifier

Trade name/designation	:	Fuel oil, residual, Heavy Fuel oil
EC Index	:	649-024-00-9
EC No	:	270-675-6
CAS No.	:	68476-33-5
Formula	:	Unspecified

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

Main use category	:	Industrial use,Professional use

1.3. Details of the supplier of the safety data sheet

Company : Mercuria Energy Trading B.V. supplying for and on behalf of Mercuria Energy Trading S.A
Herculesplein 108
3584AA Utrecht , Netherlands
Telephone +41 22 594 7000
Telefax: +41 22 594 3904
E-mail: emergency@sgs.com

1.4. Emergency telephone number

Emergency telephone : +32 3 575 11 30 (SGS 24/7 Emergency Hotline)

IRELAND (REPUBLIC OF)
National Poisons Information Centre
Beaumont Hospital +353 18 37 99 64/+353 1 809 21 66

UNITED KINGDOM
National Poisons Information Service
(Newcastle Centre) 0844 892 0111 (UK only, Monday to Friday, 08.00 to 18.00 hours)
Regional Drugs and Therapeutics Centre,
Wolfson Unit

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

2.1.1. Classification according to Regulation (EU) 1272/2008

CLP-Classification : The product is classified as hazardous in accordance with Regulation (EC) No. 1272/2008.

Acute Tox. 4 (Inhalation:dust,mist)	H332
Carc. 1B	H350
Repr. 2	H361d
STOT RE 2	H373
Asp. Tox. 1	H304
Aquatic Acute 1	H400
Aquatic Chronic 1	H410

Full text of H-phrases: see section 16

2.1.2. Classification according to EU Directives 67/548/EEC or 1999/45/EC

Classification : This substance is classified as hazardous according to 67/548/EEC.

Xn; R20
Carc.Cat.2; R45

Xn; R48/21
Repr.Cat.3; R63
R66
N; R50/53

Full text of R-phrases: see section 16

2.2. Label elements

2.2.1. Labelling according to Regulation (EU) 1272/2008

Hazard pictograms :

GHS07 GHS08 GHS09

Signal word : Danger

Hazard statements : H304 - May be fatal if swallowed and enters airways.
H332 - Harmful if inhaled.
H350 - May cause cancer.
H361d - Suspected of damaging the unborn child.
H373 - May cause damage to organs through prolonged or repeated exposure.
H410 - Very toxic to aquatic life with long lasting effects.

Precautionary statements : P201 - Obtain special instructions before use.
P260 - Do not breathe dust/fume/gas/mist/vapours/spray.
P273 - Avoid release to the environment.
P281 - Use personal protective equipment as required.
P301+P310 - IF SWALLOWED: Immediately call a POISON CENTER/doctor/.
P331 - Do NOT induce vomiting.

Extra phrases : EUH066 - Repeated exposure may cause skin dryness or cracking.

2.2.2. Labelling according to Directives (67/548 - 1999/45)

Not relevant

2.3. Other hazards

Other hazards : This substance does not meet the PBT/vPvB criteria of REACH, annex XIII.

SECTION 3: Composition/information on ingredients

3.1. Substances

Substance name	Product identifier	%	Classification according to Directive 67/548/EEC
Fuel oil, residual, Heavy Fuel oil	(CAS No.) 68476-33-5 (EC No) 265-058-3 (EC Index) 649-009-00-7	100	Carc.Cat.1; R45 Xn; R20 Xn; R48/21 Repr.Cat.3; R63 N; R50/53 R66

Substance name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP]
Fuel oil, residual, Heavy Fuel oil	(CAS No.) 68476-33-5 (EC No) 265-058-3 (EC Index) 649-009-00-7	100	Acute Tox. 4 (Inhalation), H332 Carc. 1B, H350 Repr. 2, H361d STOT RE 2, H373 Asp. Tox. 1, H304 Aquatic Acute 1, H400 Aquatic Chronic 1, H410

Full text of R- and H-phrases: see section 16

3.2. Mixtures

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

Inhalation : Remove person to fresh air and keep comfortable for breathing.
When in doubt or if symptoms are observed, get medical advice.
If breathing is irregular or stopped, administer artificial respiration.
Get immediate medical advice/attention.

Skin contact : Take off contaminated clothing.
Gently wash with plenty of soap and water.
When in doubt or if symptoms are observed, get medical advice.
In the event of a high pressure injection injury, worker should obtain immediate medical assistance.
Contact with hot product will cause thermal burns.
Immerse in cool water/wrap in wet bandages.
Get medical advice/attention.

Eye contact : Rinse immediately carefully and thoroughly with eye-bath or water.
When in doubt or if symptoms are observed, get medical advice.
Get medical advice/attention.

In case of ingestion : Rinse mouth thoroughly with water.
Do NOT induce vomiting.
Get immediate medical advice/attention.

Additional advice : First aider: Pay attention to self-protection!
Personal protection equipment: see section 8
Never give anything by mouth to an unconscious person or a person with cramps.
When in doubt or if symptoms are observed, get medical advice.
Show this safety data sheet to the doctor in attendance.
Treat symptomatically.

4.2. Most important symptoms and effects, both acute and delayed

Inhalation : Harmful if inhaled. The following symptoms may occur: Irritation.

Skin contact : The following symptoms may occur: erythema (redness) Dry skin.

Eye contact : The following symptoms may occur: Swelling of tissue blurred vision Irritation.

Ingestion : May be fatal if swallowed and enters airways. The following symptoms may occur: Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.

Other adverse effects : May cause cancer. Suspected of damaging the unborn child. May cause damage to organs through prolonged or repeated exposure. (blood, thymus, liver).

4.3. Indication of any immediate medical attention and special treatment needed

Not applicable

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Water spray, alcohol resistant foam, Dry extinguishing powder, Carbon dioxide, inert gas, Sand, Earth .

Extinguishing media which must not be used for safety reasons : Strong water jet

5.2. Special hazards arising from the substance or mixture

Fire hazard : Combustible

Specific hazards : Heating causes rise in pressure with risk of bursting.
Hazardous combustion products:
Carbon oxides,
Organic compounds,
(As appropriate :
Sulphur oxides,
Hydrogen sulfide (H2S),
Sulphuric acid)

5.3. Advice for firefighters

Advice for firefighters : Special protective equipment for firefighters.
In case of fire: Wear self-contained breathing apparatus.
Use water spray jet to protect personnel and to cool endangered containers.
Use foam on spills to minimise vapours.
Evacuate area.
Collect contaminated fire extinguishing water separately. This must not be discharged into drains.
Do not allow run-off from fire-fighting to enter drains or water courses.
Dispose according to legislation.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : Evacuate area.
Stay upwind/keep distance from source.
Provide adequate ventilation.
Use personal protective equipment as required.
Personal protection equipment: see section 8
Do not breathe vapour/spray.
Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
Ensure that the equipment is adequately grounded.
Avoid contact with skin, eyes and clothes.
Use explosion-proof machinery, apparatus, ventilation facilities, tools etc.
Use only non-sparking tools.
As appropriate :
Product may release Hydrogen Sulphide: A specific assessment of inhalation risks from the presence of hydrogen sulphide in tank headspaces, confined spaces, product residue, tank waste and waste water, and unintentional releases should be made to help determine controls appropriate to local circumstances.

For emergency responders : Ensure procedures and training for emergency decontamination and disposal are in place.
Personal protection equipment: see section 8.

6.2. Environmental precautions

Environmental precautions : Do not allow to enter into ground-water, surface water or drains.
If the product contaminates rivers and lakes or drains inform respective authorities.

6.3. Methods and material for containment and cleaning up

Methods for cleaning up : Stop leak if safe to do so.
Dam up.
Clean-up methods - small spillage: Absorb with liquid-binding material (e.g. sand, diatomaceous earth, acid- or universal binding agents)., Collect in closed and suitable containers for disposal.
Clean-up methods - large spillage: Large spills should be collected

mechanically (remove by pumping) for disposal., Collect in closed and suitable containers for disposal.
Use foam on spills to minimise vapours.
Site should have a spill plan to ensure that adequate safeguards are in place to minimize the impact of episodic releases.
Dispose of waste product or used containers according to local regulations.

6.4. Reference to other sections

Personal protection equipment: see section 8
Disposal: see section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Handling : Provide adequate ventilation.
Use personal protective equipment as required.
Personal protection equipment: see section 8
Do not breathe vapour/spray.
Avoid contact with skin, eyes and clothes.
Take any precaution to avoid mixing with incompatible materials.
See also section 10
Ensure proper process control to avoid excess waste discharge (temperature, concentration, pH, time).
Do not allow contact with soil, surface or ground water.
Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
Ensure that the equipment is adequately grounded.
Use explosion-proof machinery, apparatus, ventilation facilities, tools etc.
Use only non-sparking tools.
As appropriate :
Product may release Hydrogen Sulphide: A specific assessment of inhalation risks from the presence of hydrogen sulphide in tank headspaces, confined spaces, product residue, tank waste and waste water, and unintentional releases should be made to help determine controls appropriate to local circumstances.

Advices on general occupational hygiene : Keep good industrial hygiene.
Wash hands before breaks and immediately after using the product.
When using do not eat, drink or smoke.
Keep away from food, drink and animal feedingstuffs.
Keep work clothes separately.
Take off contaminated clothing.
Wash contaminated clothing before reuse.

7.2. Conditions for safe storage, including any incompatibilities

Storage : Keep in a dry, cool and well-ventilated place.
Do not store near or with any of the incompatible materials listed in section 10.
Bund storage facilities to prevent soil and water pollution in the event of spillage.
Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
as appropriate :
Product may release Hydrogen Sulphide: A specific assessment of inhalation risks from the presence of hydrogen sulphide in tank headspaces, confined spaces, product residue, tank waste and waste water, and unintentional releases should be made to help determine controls appropriate to local circumstances.

Packaging materials : Keep/Store only in original container.
Suitable material:

Stainless steel
Carbon steel
Unsuitable material:
synthetic material

7.3 Specific end use(s)

No data available.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Exposure limit values : Not applicable

8.2. Exposure controls

Personal protection equipment : The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection : In case of insufficient ventilation, wear suitable respiratory equipment.
Half-face mask (EN 140)
Full face mask (EN 136)
Filter type: ABEK / P (EN 141)
The filter class must be suitable for the maximum contaminant concentration (gas/vapour/aerosol/particulates) that may arise when handling the product. If the concentration is exceeded, self-contained breathing apparatus must be used. (EN 137)

Hand protection : Wear chemically resistant gloves (tested to EN374) ,Suitable material:,NBR (Nitrile rubber),The quality of the protective gloves resistant to chemicals must be chosen as a function of the specific working place concentration and quantity of hazardous substances.

Eye protection : Use suitable eye protection. (EN166): Safety glasses

Body protection : Wear suitable protective clothing.
Wear suitable coveralls to prevent exposure to the skin.
(Chemical protection clothing)

Thermal hazard protection : Use dedicated equipment.
Not required under normal use.

Engineering control measures : Provide adequate ventilation.
Organisational measures to prevent/limit releases, dispersion and exposure
Safe handling: see section 7 .
Use only outdoors or in a well-ventilated area.
Store locked up.

Environmental exposure controls : Comply with applicable Community environmental protection legislation.
Do not allow contact with soil, surface or ground water.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance	:	liquid
Colour	:	No data available
Odour	:	characteristic
Odour threshold	:	No data available
pH	:	No data available

Melting point/freezing point	:	-1 - 13 °C
Initial boiling point and boiling range	:	No data available
Flash point	:	>= 71 °C (closed cup)
Evaporation rate	:	No data available
Flammability (solid, gas)	:	Not applicable, liquid
Upper/lower flammability or explosive limits	:	No data available
Vapour pressure	:	> 5 hPa (at 20 °C)
Vapour density	:	No data available
Density	:	0,84 g/cm³ (at 15 °C)
Relative density	:	No data available
Water solubility	:	< 0,1 g/l (at 20 °C)
Solubility in different media	:	No data available
Partition coefficient n-octanol/water	:	No data available
Auto-ignition temperature	:	No data available
Decomposition temperature	:	No data available
Viscosity	:	No data available
Explosive properties	:	Not applicable The study does not need to be conducted because there are no chemical groups associated with explosive properties present in the molecule.
Oxidising properties	:	Not applicable The classification procedure needs not to be applied because there are no chemical groups present in the molecule which are associated with oxidising properties.

9.2. Other information

No data available

SECTION 10: Stability and reactivity

10.1. Reactivity

Reactivity : Combustible
Reference to other sections: 10.5

10.2. Chemical stability

Stability : The product is stable under storage at normal ambient temperatures.

10.3. Possibility of hazardous reactions

Possibility of hazardous reactions : None under normal processing.

10.4. Conditions to avoid

Conditions to avoid : Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
Safe handling: see section 7

10.5. Incompatible materials

Incompatible materials : Oxidising substances, Safe handling: see section 7

10.6. Hazardous decomposition products

Hazardous decomposition products : Burning produces noxious and toxic fumes. Reference to other sections: 5.2

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Inhalation:dust,mist: Harmful if inhaled.

Fuel oil, residual, Heavy Fuel oil (68476-33-5)	
LD50/oral/rat	> 2000 mg/kg
LD50/dermal/rat	> 2000 mg/kg

Skin corrosion/irritation : Not classified (Based on available data, the classification criteria are not met.)
pH: No data available

Serious eye damage/eye irritation : Not classified (Based on available data, the classification criteria are not met.)
pH: No data available

Respiratory or skin sensitisation : Not classified (Based on available data, the classification criteria are not met.)

Germ cell mutagenicity : Not classified (Based on available data, the classification criteria are not met.)

Carcinogenicity : May cause cancer.

Reproductive toxicity : Suspected of damaging the unborn child.

STOT-single exposure : Not classified (Based on available data, the classification criteria are not met.)

STOT-repeated exposure : May cause damage to organs through prolonged or repeated exposure.

Aspiration hazard : May be fatal if swallowed and enters airways.

Other information

Symptoms related to the physical, chemical and toxicological characteristics,For further information see section 4

SECTION 12: Ecological information

12.1. Toxicity

Toxicity : Very toxic to aquatic life with long lasting effects.

Fuel oil, residual, Heavy Fuel oil (68476-33-5)	
LC50 fish 1	35 mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through])
LC50 fish 2	48 mg/l (Exposure time: 96 h - Species: Brachydanio rerio [semi-static])

12.2. Persistence and degradability

Persistence and degradability : No data available
Substance is complex UVCB.

12.3. Bioaccumulative potential

Bioaccumulation : No data available
Substance is complex UVCB

Partition coefficient n-octanol/water : No data available

12.4. Mobility in soil

Mobility : No data available
Substance is complex UVCB

12.5. Results of PBT and vPvB assessment

PBT/vPvB data : This substance does not meet the PBT/vPvB criteria of REACH, annex XIII.

12.6. Other adverse effects

Other information : No data available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Product waste: : Handle with care.
Do not allow contact with soil, surface or ground water.
Dispose of empty containers and wastes safely.
Safe handling: see section 7
Refer to manufacturer/supplier for information on recovery/recycling.
Recycling is preferred to disposal or incineration
If recycling is not possible, eliminate in accordance with local valid waste disposal regulations

Contaminated packaging : Never use pressure to empty container.
Do not pierce or burn, even after use.
Handle contaminated packages in the same way as the substance itself.
Dispose according to legislation.

List of proposed waste codes/waste designations in accordance with EWC : Classified as hazardous waste according to European Union regulations.
Waste codes should be assigned by the user, preferably in discussion with the waste disposal authorities.

SECTION 14: Transport information

14.1. UN number

UN number : 3082

14.2. UN proper shipping name

Proper Shipping Name : ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.
Proper shipping name IATA/IMDG : ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.

14.3. Transport hazard class(es)

14.3.1. Overland transport

Class(es) : 9 - Miscellaneous dangerous substances and articles
Hazard identification number (Kemler No.) : 90
Classification code : M6
ADR/RID-Labels : 9 - Miscellaneous dangerous substances and articles

14.3.2. Inland waterway transport (ADN)

ADN : Hazards : 9 + N1+CMR+Fp
Class (UN) : 9

14.3.3. Transport by sea

Class or Division : 9 - Miscellaneous dangerous substances and articles

14.3.4. Air transport

Class or Division : 9 - Miscellaneous dangerous substances and articles

14.4. Packing group

Packing group : III

14.5. Environmental hazards

Environmental hazards : N

Other information : ADN : N1.

14.6 Special precautions for user

Special precautions for user : No data available.

14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

No data available

SECTION 15: Regulatory information

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

15.1.1. EU-Regulations

The following restrictions are applicable according to Annex XVII of the REACH Regulation (EC) No 1907/2006	:
3. Liquid substances or mixtures which are regarded as dangerous in accordance with Directive 1999/45/EC or are fulfilling the criteria for any of the following hazard classes or categories set out in Annex I to Regulation (EC) No 1272/2008	: Fuel oil, residual, Heavy Fuel oil
28. Substances which appear in Part 3 of Annex VI to Regulation (EC) No 1272/2008 classified as Carcinogen category 1A or 1B (Table 3.1) or Carcinogen category 1 or 2 (Table 3.2) and listed as follows: Carcinogen category 1A (Table 3.1)/Carcinogen category 1 (Table 3.2) listed in Appendix 1 Carcinogen category 1B (Table 3.1)/Carcinogen category 2 (Table 3.2) listed in Appendix 2	: Fuel oil, residual, Heavy Fuel oil
This product contains an ingredient according to the candidate list of Annex XIV of the REACH Regulation 1907/2006/EC.	: None
Authorisations	: Not applicable

15.1.2. National regulations

DE :	WGK	:	3
DE :	TA-Luft	:	Carcinogenic substances
DE :	Technische Regeln für Gefahrstoffe (TRGS)	:	applicable
FR :	Installations classées	:	117X
NL :	ABM	:	3 - May cause cancer. (A)
NL :	NeR (Nederlandse emissie Richtlijn)	:	Organic substances in vapour or gaseous form
NO :	Produktforskriften (FOR 2004-06-01 nr 922)	:	Carcinogen

15.2. Chemical safety assessment

Chemical Safety Assessment : For this substance a chemical safety assessment has not been carried out.

SECTION 16: Other information

Full text of R-, H- and EUH-phrases:

Acute Tox. 4 (Inhalation)	:	Acute toxicity (inhal.), Category 4
Acute Tox. 4 (Inhalation:dust,mist)	:	Acute toxicity Category 4
Aquatic Acute 1	:	Hazardous to the aquatic environment - Aquatic Acute 1
Aquatic Chronic 1	:	Hazardous to the aquatic environment - chronic hazard category 1
Asp. Tox. 1	:	Aspiration hazard, Category 1
Carc. 1B	:	Carcinogenicity, Category 1B
Repr. 2	:	Reproductive toxicity, Hazard Category 2
STOT RE 2	:	Specific target organ toxicity — Repeated exposure, Category 2
H304	:	May be fatal if swallowed and enters airways.
H332	:	Harmful if inhaled.
H350	:	May cause cancer.
H361d	:	Suspected of damaging the unborn child.
H373	:	May cause damage to organs through prolonged or repeated exposure.
H400	:	Very toxic to aquatic life.
H410	:	Very toxic to aquatic life with long lasting effects.
R20	:	Harmful by inhalation.
R45	:	May cause cancer.
R48/21	:	Harmful: danger of serious damage to health by prolonged exposure in contact with skin.
R50/53	:	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R63	:	Possible risk of harm to the unborn child.
R66	:	Repeated exposure may cause skin dryness or cracking.
N	:	Dangerous for the environment
Xn	:	Harmful

Key literature references and sources for data : LOLI

Abbreviations and acronyms :
DNEL = Derived No Effect Level
Derived minimal effect level
Predicted No Effect Concentration
Occupational Exposure Limits - Short Term Exposure Limits (STELs)
time weighted average
Median lethal concentration
Median lethal dose
Median lethal level
EC50 = Median Effective Concentration
EL50 = Median effective level
ErC50 = EC50 in terms of reduction of growth rate
ErL50 = EL50 in terms of reduction of growth rate
No-observed-effect level
NOEC = No observed effect concentration
NOELR = No observed effect loading rate
NOAEC = No observed adverse effect concentration
NOAEL = No observed adverse effect level
European Waste Catalogue
Not applicable
N.O.S. = Not Otherwise Specified
Volatile organic compounds
mg/kg bodyweight
Quantitative structure-acivity relationship (QSAR)
ADN = Accord Européen relatif au Transport International des Marchandises Dangereuses par voie de Navigation du Rhin
ADR = Accord européen relatif au transport international des marchandises Dangereuses par Route

CLP = Classification, Labelling and Packaging Regulation according to 1272/2008/EC
IATA = International Air Transport Association
IMDG = International Maritime Dangerous Goods Code
LEL = Lower Explosive Limit/Lower Explosion Limit
UEL = Upper Explosion Limit/Upper Explosive Limit
REACH = Registration, Evaluation, Authorisation and Restriction of Chemicals
WGK = Wassergefährdungsklasse (Water Hazard Class under German Federal Water Management Act)
ABM = Algemene beoordelingsmethodiek
BTT = Breakthrough time (maximum wearing time)
STOT = Specific Target Organ Toxicity

The contents and format of this SDS are in accordance with EEC Commission Directive 1999/45/EC, 67/548/EC, 1272/2008/EC and EEC Commission Regulation 1907/2006/EC (REACH) Annex II.

WATER TREATMENT AND ACID SHACK CHEMICALS

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MATERIAL SAFETY DATA SHEET OF SODIUM SULPHIDE

Product Identification

PHYSICAL STATE	: white granular powder
CAS NO.	: 1313-82-2
EINECS NO.	: 215-211-5
FORMULA	: Na_2S
MOL WT.	: 78.04
H.S. CODE	: 2832.10
TOXICITY	: Oral rat LD50: 208 mg/kg
SYNONYMS	: Sodium monosulfide; Hesthsulphid; Sodium sulfuret; Disodium monosulfide; Disodium sulfide; Sodium Sulphide;

First Aid Measures

General information:
Instantly remove any clothing soiled by the product. Symptoms of poisoning may even occur after several hours; therefore medical observation for at least 48 hours after the accident.

After Inhalation:
Supply fresh air; consult doctor in case of symptoms. In case of unconsciousness bring patient into stable side position for transport.

After Skin Contact:
Instantly wash with water and soap and rinse thoroughly. If skin irritation continues, consult a doctor.

After Eye Contact:
Rinse opened eye for several minutes under running water. Then consult doctor.

After Swallowing:
Drink copious amounts of water and provide fresh air. Instantly call for doctor.

Information For Doctor:
Treatment: Medical supervision for at least 48 hours.

Physical Data

PHYSICAL STATE	: yellow to red flakes
SPECIFIC GRAVITY	: 1.86
SOLUBILITY IN WATER	: Soluble (slightly soluble in alcohol)
pH	: Alkaline
NFPA RATINGS	: Health: 3 Flammability: 0 Reactivity: 0
STABILITY	: Stable under ordinary conditions. Oxidizes in air .

Preventive Measures

Accidental Release Measures

Person-related safety precautions:

Ensure adequate ventilation.
Put on breathing apparatus.
Wear protective clothing.

Measures for environmental protection:

Do not allow product to reach sewage system, water bodies, ground or soil.If material reaches soil, water bodies or sewage system inform authorities responsible for such cases.

Measures for cleaning/collecting:

Ensure adequate ventilation. Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust). Use neutralizing agent.

Additional information: See Section Disposal considerations for information on disposal.

Handling and Storage

Handling

Information for safe handling:

No special precautions necessary if used correctly.

Information about protection against explosions and fires:

The product is not flammable.

Storage

Requirements to be met by storerooms and containers:

Provide alkali-resistant floor.

Information about storage in one common storage facility:

Do not store together with acids.

Further information about storage conditions:

Protect from frost.
Keep container tightly sealed.
Store container in a well ventilated position.
The stability which is noticed on the label is only duty by right storage of the product.

Protective Measures

Components with critical values that require monitoring at the workplace:
The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.

Additional information:
The lists that were valid during the compilation were used as basis.

Personal protective equipment

General protective and hygienic measures:
Keep away from foodstuffs, beverages and food.
Instantly remove any soiled and impregnated garments.
Wash hands during breaks and at the end of the work.
Use skin protection cream for preventive skin protection.
Avoid contact with the eyes and skin.

Protection of hands: Alkaline resistant gloves

Eye protection: Tightly sealed safety glasses

Body protection: Alkaline-resistant protective clothing

Stability and Reactivity

Thermal decomposition / conditions to be avoided:
No decomposition if used and stored according to specifications.

Dangerous reactions:
Strong exothermic reaction with acids.
Contact with acids releases toxic gases.

Dangerous products of composition:
Hydrogen sulphide None at correctly use.

Toxicological Information

Acute toxicity

Primary irritant effect:

on the skin: Irritant for skin and mucous membranes.

on the eye: Irritant effect.

Sensitization: No sensitizing effect known.

Additional toxicological information:
The product shows the following dangers according to the calculation method of the General EC
Classification Guidelines for Preparations as issued in the latest version:
Harmful
Irritant

Ecological Information

Additional ecological information:
AOX-indication: The product does not contain organically bonded halogen compounds.
General notes:
Do not allow product to reach ground water, water bodies or sewage system, even in small quantities.

Disposal considerations

Product:
Recommendation:
Must not be disposed of together with household garbage. Do not allow product to reach sewage system.
Waste disposal key number:
Suggestion according to the Euroean Waste Catalogue (EWC):
11 01 09, sludges and filter cakes containing dangerous substances
11 01 11, aqueous rinsing liquids containing dangerous substances
The mentioned waste codes are recommendations based on the product application as suggested by the manufacturer. Special applications and special disposal conditions at the applier's place may however require another waste code.
Uncleaned packagings:
Recommendation:
Empty contaminated packagings thoroughly. They can be recycled after thorough and proper cleaning.
Disposal must be made according to official regulations.
Recommended cleaning agent: Water, if necessary with cleaning agent.

Transport Information

Land transport ADR/RID (cross-border)

ADR/RID Class: 8 (C6) Corrosive substances.
Kemler Number: 80
UN-Number: 1849
Packaging group: II
Label: 8
Designation of goods: 1849 SODIUM SULPHIDE, HYDRATED, solution

Maritime transport IMDG

IMDG Class: 8
UN Number: 1849
Label 8
Packaging group: II
EMS Number: F-A,S-B
Label: 8
Marine pollutant: N
Correct technical name: SODIUM SULPHIDE, HYDRATED, solution

Air transport ICAO-TI and IATA-DGR

ICAO/IATA Class: 8
UN/ID Number: 1849
Label: 8
Label 8
Packaging group: II
Correct technical name: SODIUM SULPHIDE, HYDRATED, solution

Ferric Sulfate 60%

Safety Data Sheet

According to U.S. Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations and according to Canada's Hazardous Products Regulation, February 11, 2015.

Revision Date: 05/10/2018 Date of Issue: 05/08/2015 Version: 4.0

SECTION 1: IDENTIFICATION

Product Identifier

Product Form: Mixture

Product Name: Ferric Sulfate 60%

Intended Use of the Product

Municipal and industrial water and wastewater treatment for the removal of turbidity, color, suspended solids and phosphorus. Sludge conditioning, compaction and volume reduction. Oily wastewater clarification and dissolved air flotation. Emulsion breaking.

Name, Address, and Telephone of the Responsible Party

Manufacturer

CHEMTRADE LOGISTICS INC.
155 Gordon Baker Road
Suite 300
Toronto, Ontario M2H 3N5
For SDS Info: (416) 496-5856
www.chemtradelogistics.com

Emergency Telephone Number

Emergency Number : Canada: CANUTEC +1-613-996-6666 / US: CHEMTREC +1-800-424-9300
INTERNATIONAL: +1-703-741-5970
Chemtrade Emergency Contact: (866) 416-4404
For Chemical Emergency, Spill, Leak, Fire, Exposure, or Accident, call CHEMTREC – Day or Night

SECTION 2: HAZARDS IDENTIFICATION

Classification of the Substance or Mixture

GHS Classification

Met. Corr. 1	H290
Acute Tox. 4 (Oral)	H302
Skin Corr. 1A	H314
Eye Dam. 1	H318

Full text of hazard classes and H-statements : see section 16

Label Elements

GHS Labeling

Hazard Pictograms :

GHS05 GHS07

Signal Word : Danger

Hazard Statements : H290 - May be corrosive to metals.
H302 - Harmful if swallowed.
H314 - Causes severe skin burns and eye damage.
H318 - Causes serious eye damage.

Precautionary Statements : P234 - Keep only in original container.
P260 - Do not breathe vapors, mist, or spray.
P264 - Wash hands, forearms, and other exposed areas thoroughly after handling.
P270 - Do not eat, drink or smoke when using this product.
P280 - Wear protective gloves, protective clothing, and eye protection.
P301+P312 - IF SWALLOWED: Call a POISON CENTER or doctor if you feel unwell.
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.
P304+P340 - IF INHALED: 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.
P310 - Immediately call a POISON CENTER or doctor.
P321 - Specific treatment (see section 4 on this SDS).
P330 - Rinse mouth.
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 in accordance with local, regional, national, territorial, provincial, and international regulations.

Other Hazards

May produce explosive hydrogen gas on contact with incompatibilities or upon thermal decomposition.

Unknown acute toxicity

No data available

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Mixture

Name	Product Identifier	%*	GHS Ingredient Classification
Water	(CAS-No.) 7732-18-5	25 - 64	Not classified
Sulfuric acid, iron(3+) salt (3:2)**	(CAS-No.) 10028-22-5	45 - 70[+]	Met. Corr. 1, H290 Acute Tox. 4 (Oral), H302 Skin Irrit. 2, H315 Eye Dam. 1, H318
Sulfuric acid***	(CAS-No.) 7664-93-9	1 – 5[+]	Skin Corr. 1A, H314 Eye Dam. 1, H318 Carc. 1A, H350 Aquatic Acute 3, H402

Full text of H-phrases: see section 16

*Percentages are listed in weight by weight percentage (w/w%) for liquid and solid ingredients. Gas ingredients are listed in volume by volume percentage (v/v%).

**As Fe2(SO4)3●9H2O (Dry Ferric Sulfate)

***Strong inorganic acid aerosols/mists containing this substance are carcinogenic to humans. However, under conditions of normal use this is not a potential route of exposure, and does not warrant a carcinogenicity classification for the mixture.

[+]The actual concentration of the ingredient(s) is withheld as a trade secret in accordance with Regulations Amending the Hazardous Products Regulations (HPR) SOR/2018-68 and 29 CFR 1910.1200.

SECTION 4: FIRST AID MEASURES

Description of First-aid Measures

General: Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).

Inhalation: When symptoms occur: go into open air and ventilate suspected area. Obtain medical attention if breathing difficulty persists.

Skin Contact: Remove contaminated clothing. Immediately flush skin with plenty of water for at least 30 minutes. Wash contaminated clothing before reuse. Get immediate medical advice/attention.

Eye Contact: Rinse cautiously with water for at least 30 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get immediate medical advice/attention.

Ingestion: Rinse mouth. Do NOT induce vomiting. Obtain medical attention.

Most Important Symptoms and Effects Both Acute and Delayed

General: Harmful if swallowed. Causes severe skin burns and eye damage. May be corrosive to the respiratory tract.

Inhalation: May be corrosive to the respiratory tract.

Skin Contact: Causes severe irritation which will progress to chemical burns.

Eye Contact: Causes permanent damage to the cornea, iris, or conjunctiva.

Ingestion: This material is harmful orally and can cause adverse health effects or death in significant amounts. May cause burns or irritation of the linings of the mouth, throat, and gastrointestinal tract.

Chronic Symptoms: None expected under normal conditions of use.

Indication of Any Immediate Medical Attention and Special Treatment Needed

If exposed or concerned, get medical advice and attention. If medical advice is needed, have product container or label at hand.

SECTION 5: FIRE-FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media: Water spray, dry chemical, foam, carbon dioxide.

Unsuitable Extinguishing Media: Do not use a heavy water stream. Use of heavy stream of water may spread fire.

Special Hazards Arising From the Substance or Mixture

Fire Hazard: Not considered flammable but may burn at high temperatures.

Explosion Hazard: Contact with metallic substances may release flammable hydrogen gas.

Reactivity: May be corrosive to metals. Contact with metals may evolve flammable hydrogen gas. May react exothermically with water releasing heat. Adding an acid to a base or base to an acid may cause a violent reaction.

Advice for Firefighters

Precautionary Measures Fire: Exercise caution when fighting any chemical fire.

Firefighting Instructions: Use water spray or fog for cooling exposed containers.

Protection During Firefighting: Do not enter fire area without proper protective equipment, including respiratory protection.

Hazardous Combustion Products: Sulfur oxides. Corrosive vapors.

Other Information: Do not allow run-off from fire fighting to enter drains or water courses.

Reference to Other Sections

Refer to Section 9 for flammability properties.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

General Measures: Do not get in eyes, on skin, or on clothing. Do not breathe vapor, mist or spray.

For Non-Emergency Personnel

Protective Equipment: Use appropriate personal protective equipment (PPE).

Emergency Procedures: Evacuate unnecessary personnel.

For Emergency Personnel

Protective Equipment: Equip cleanup crew with proper protection.

Emergency Procedures: Upon arrival at the scene, a first responder is expected to recognize the presence of dangerous goods, protect oneself and the public, secure the area, and call for the assistance of trained personnel as soon as conditions permit. Ventilate area.

Environmental Precautions

Prevent entry to sewers and public waters. Avoid release to the environment. Collect spillage.

Methods and Materials for Containment and Cleaning Up

For Containment: Contain any spills with dikes or absorbents to prevent migration and entry into sewers or streams. As an immediate precautionary measure, isolate spill or leak area in all directions.

Methods for Cleaning Up: Clean up spills immediately and dispose of waste safely. Cautiously neutralize spilled liquid. Absorb spillage to prevent material damage. Transfer spilled material to a suitable container for disposal. Contact competent authorities after a spill.

Reference to Other Sections

See Section 8 for exposure controls and personal protection and Section 13 for disposal considerations.

SECTION 7: HANDLING AND STORAGE

Precautions for Safe Handling

Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Handle empty containers with care because they may still present a hazard. Do not get in eyes, on skin, or on clothing. Do not breathe mist, spray, vapors.

Additional Hazards When Processed: May be corrosive to metals. May release corrosive vapors.

Hygiene Measures: Handle in accordance with good industrial hygiene and safety procedures.

Conditions for Safe Storage, Including Any Incompatibilities

Technical Measures: Comply with applicable regulations.

Storage Conditions: Keep container closed when not in use. Store in a dry, cool place. Keep/Store away from extremely high or low temperatures and incompatible materials. Store in original container or corrosive resistant and/or lined container.

Incompatible Materials: Strong acids, strong bases, strong oxidizers. Alkalis. Metals.

Specific End Use(s)

Municipal and industrial water and wastewater treatment for the removal of turbidity, color, suspended solids and phosphorus. Sludge conditioning, compaction and volume reduction. Oily wastewater clarification and dissolved air flotation. Emulsion breaking.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters

For substances listed in section 3 that are not listed here, there are no established Exposure limits from the manufacturer, supplier, importer, or the appropriate advisory agency including: ACGIH (TLV), AIHA (WEEL), NIOSH (REL), OSHA (PEL), Canadian provincial governments, or the Mexican government.

Sulfuric acid (7664-93-9)		
Mexico	OEL TWA (mg/m³)	1 mg/m³
USA ACGIH	ACGIH TWA (mg/m³)	0.2 mg/m³ (thoracic particulate matter)
USA ACGIH	ACGIH chemical category	Suspected Human Carcinogen contained in strong inorganic acid mists
USA OSHA	OSHA PEL (TWA) (mg/m³)	1 mg/m³
USA NIOSH	NIOSH REL (TWA) (mg/m³)	1 mg/m³
USA IDLH	US IDLH (mg/m³)	15 mg/m³
Alberta	OEL STEL (mg/m³)	3 mg/m³
Alberta	OEL TWA (mg/m³)	1 mg/m³
British Columbia	OEL TWA (mg/m³)	0.2 mg/m³ (Thoracic, contained in strong inorganic acid mists)
Manitoba	OEL TWA (mg/m³)	0.2 mg/m³ (thoracic particulate matter)
New Brunswick	OEL STEL (mg/m³)	3 mg/m³
New Brunswick	OEL TWA (mg/m³)	1 mg/m³
Newfoundland & Labrador	OEL TWA (mg/m³)	0.2 mg/m³ (thoracic particulate matter)
Nova Scotia	OEL TWA (mg/m³)	0.2 mg/m³ (thoracic particulate matter)
Nunavut	OEL STEL (mg/m³)	0.6 mg/m³ (thoracic fraction)
Nunavut	OEL TWA (mg/m³)	0.2 mg/m³ (thoracic fraction)
Northwest Territories	OEL STEL (mg/m³)	0.6 mg/m³ (thoracic fraction, strong acid mists only)
Northwest Territories	OEL TWA (mg/m³)	0.2 mg/m³ (thoracic fraction, strong acid mists only)
Ontario	OEL TWA (mg/m³)	0.2 mg/m³ (thoracic)
Prince Edward Island	OEL TWA (mg/m³)	0.2 mg/m³ (thoracic particulate matter)
Québec	VECD (mg/m³)	3 mg/m³
Québec	VEMP (mg/m³)	1 mg/m³
Saskatchewan	OEL STEL (mg/m³)	0.6 mg/m³ (thoracic fraction)
Saskatchewan	OEL TWA (mg/m³)	0.2 mg/m³ (thoracic fraction)
Yukon	OEL STEL (mg/m³)	1 mg/m³
Yukon	OEL TWA (mg/m³)	1 mg/m³

Exposure Controls

Appropriate Engineering Controls: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Ensure adequate ventilation, especially in confined areas. Ensure all national/local regulations are observed.

Personal Protective Equipment: Gloves. Protective clothing. Protective goggles. Face shield. Insufficient ventilation: wear respiratory protection.

Materials for Protective Clothing: Acid-resistant clothing.

Hand Protection: Wear protective gloves.

Eye Protection: Chemical safety goggles and face shield.

Skin and Body Protection: Wear suitable protective clothing.

Respiratory Protection: If exposure limits are exceeded or irritation is experienced, approved respiratory protection should be worn. In case of inadequate ventilation, oxygen deficient atmosphere, or where exposure levels are not known wear approved respiratory protection.

Environmental Exposure Controls: Do not allow the product to be released into the environment.

Consumer Exposure Controls: Do not eat, drink, or smoke during use.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on Basic Physical and Chemical Properties

Physical State	:	Liquid
Appearance	:	Reddish brown
Odor	:	Not available
Odor Threshold	:	Not available
pH	:	< 1
Evaporation Rate	:	Not available
Melting Point	:	< -18 °C (< -0.4 °F)
Freezing Point	:	Not available
Boiling Point	:	Not available
Flash Point	:	Not applicable
Auto-ignition Temperature	:	Not applicable
Decomposition Temperature	:	Not available
Flammability (solid, gas)	:	Not flammable
Lower Flammable Limit	:	Not applicable
Upper Flammable Limit	:	Not applicable
Vapor Pressure	:	Not available
Relative Vapor Density at 20°C	:	Not available
Relative Density	:	Not available
Specific Gravity	:	1.24 - 1.62
Solubility	:	100%
Partition Coefficient: N-Octanol/Water	:	Not available
Viscosity	:	Not available
VOC content	:	< 1 %

SECTION 10: STABILITY AND REACTIVITY

Reactivity: May be corrosive to metals. Contact with metals may evolve flammable hydrogen gas. May react exothermically with water releasing heat. Adding an acid to a base or base to an acid may cause a violent reaction.

Chemical Stability: Stable under recommended handling and storage conditions (see section 7).

Possibility of Hazardous Reactions: Hazardous polymerization will not occur.

Conditions to Avoid: Extremely high or low temperatures and incompatible materials.

Incompatible Materials: Strong acids, strong bases, strong oxidizers. Alkalis. Metals.

Hazardous Decomposition Products: Thermal decomposition generates: Corrosive vapors. Sulfur oxides.

SECTION 11: TOXICOLOGICAL INFORMATION

Information on Toxicological Effects - Product

Acute Toxicity (Oral): Oral: Harmful if swallowed.

Acute Toxicity (Dermal): Not classified

Acute Toxicity (Inhalation): Not classified

LD50 and LC50 Data:

Ferric Sulfate 60%	
ATE (Oral)	802.10 mg/kg body weight

Skin Corrosion/Irritation: Causes severe skin burns and eye damage.

pH: < 1

Eye Damage/Irritation: Causes serious eye damage.

pH: < 1

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Carcinogenicity: Not classified

Specific Target Organ Toxicity (Repeated Exposure): Not classified

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Single Exposure): Not classified

Aspiration Hazard: Not classified

Symptoms/Effects After Inhalation: May be corrosive to the respiratory tract.

Symptoms/Effects After Skin Contact: Causes severe irritation which will progress to chemical burns.

Symptoms/Effects After Eye Contact: Causes permanent damage to the cornea, iris, or conjunctiva.

Symptoms/Effects After Ingestion: This material is harmful orally and can cause adverse health effects or death in significant amounts. May cause burns or irritation of the linings of the mouth, throat, and gastrointestinal tract.

Chronic Symptoms: None expected under normal conditions of use.

Information on Toxicological Effects - Ingredient(s)

LD50 and LC50 Data:

Sulfuric acid, iron(3+) salt (3:2) (10028-22-5)	
LD50 Oral Rat	500 - 2000 mg/kg

Sulfuric acid (7664-93-9)	
LD50 Oral Rat	2140 mg/kg

Water (7732-18-5)	
LD50 Oral Rat	> 90000 mg/kg

Sulfuric acid (7664-93-9)	
IARC Group	1
OSHA Hazard Communication Carcinogen List	In OSHA Hazard Communication Carcinogen list.

SECTION 12: ECOLOGICAL INFORMATION

Toxicity No additional information available

Sulfuric acid (7664-93-9)	
LC50 Fish 1	500 mg/l (Exposure time: 96 h - Species: Brachydanio rerio [static])
LC50 Fish 2	42 mg/l (Exposure time: 96 h - Species: Gambusia affinis [static])

Persistence and Degradability

Ferric Sulfate 60%	
Persistence and Degradability	May cause long-term adverse effects in the environment.

Bioaccumulative Potential

Ferric Sulfate 60%	
Bioaccumulative Potential	Not established.

Sulfuric acid (7664-93-9)	
BCF Fish 1	(no bioaccumulation)

Mobility in Soil Not available

Other Adverse Effects

Other Information: Avoid release to the environment.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal Recommendations: Dispose of contents/container in accordance with local, regional, national, territorial, provincial, and international regulations.

Additional Information: Container may remain hazardous when empty. Continue to observe all precautions.

Ecology - Waste Materials: Avoid release to the environment. This material is hazardous to the aquatic environment. Keep out of sewers and waterways.

SECTION 14: TRANSPORT INFORMATION

TRANSPORTATION CLASSIFICATION	DOT	TDG	IMDG	IATA
Identification Number	UN3264	UN3264	UN3264	UN3264
Proper Shipping Name	CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (CONTAINS FERRIC SULFATE, SULFURIC ACID)	CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (CONTAINS FERRIC SULFATE, SULFURIC ACID)	CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (CONTAINS FERRIC SULFATE, SULFURIC ACID)	CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (CONTAINS FERRIC SULFATE, SULFURIC ACID)
Transport Hazard Class(es)	8	8	8	8
				
Packing Group	II	II	II	II
Environmental Hazards	**Marine Pollutant :** No	**Marine Pollutant** : No	**Marine Pollutant** : No	**Marine Pollutant**: N/A
Emergency Response	**ERG Number :** 154	**ERAP Index:** Not applicable	**EMS:** F-A, S-B	**ERG code (IATA):** 8L
Additional Information	Not applicable	Not applicable	Not applicable	Not applicable

SECTION 15: REGULATORY INFORMATION

US Federal Regulations

Chemical Name (CAS No.)	CERCLA RQ	EPCRA 304 RQ	SARA 302 TPQ	SARA 313
Sulfuric acid, iron(3+) salt (3:2) (10028-22-5)	1000 lb	Not applicable	Not applicable	No
Sulfuric acid (7664-93-9)	1000 lb	1000 lb	1000 lb	Yes

SARA 311/312

Ferric Sulfate 50%
Immediate (acute) health hazard

US TSCA Flags Not present

US State Regulations

California Proposition 65

Chemical Name (CAS No.)	Carcinogenicity	Developmental Toxicity	Female Reproductive Toxicity	Male Reproductive Toxicity
Sulfuric acid, iron(3+) salt (3:2) (10028-22-5)	No	No	No	No
Sulfuric acid (7664-93-9)	Yes	No	No	No

State Right-To-Know Lists

Sulfuric acid, iron(3+) salt (3:2) (10028-22-5)

U.S. - Massachusetts - Right To Know List - Yes
U.S. - New Jersey - Right to Know Hazardous Substance List - Yes
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List - Yes
U.S. - Pennsylvania - RTK (Right to Know) - Special Hazardous Substances - No
U.S. - Pennsylvania - RTK (Right to Know) List - Yes

Sulfuric acid (7664-93-9)

U.S. - Massachusetts - Right To Know List - Yes
U.S. - New Jersey - Right to Know Hazardous Substance List - Yes
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List - Yes
U.S. - Pennsylvania - RTK (Right to Know) - Special Hazardous Substances - No
U.S. - Pennsylvania - RTK (Right to Know) List - Yes

Canadian Regulations

Sulfuric acid, iron(3+) salt (3:2) (10028-22-5)

Listed on the Canadian DSL (Domestic Substances List)
Not listed on the Canadian NDSL (Non-Domestic Substances List)

Sulfuric acid (7664-93-9)

Listed on the Canadian DSL (Domestic Substances List)
Not listed on the Canadian NDSL (Non-Domestic Substances List)

International Inventories/Lists

Chemical Name (CAS No.)	Australia AICS	Turkey CICR	Korea ECL	EU EINECS	EU ELINCS	EU SVHC	EU NLP	Mexico INSQ
Sulfuric acid, iron(3+) salt (3:2) (10028-22-5)	Yes	No	Yes	Yes	No	No	No	Yes
Sulfuric acid (7664-93-9)	Yes	No	Yes	Yes	No	No	No	No

Chemical Name (CAS No.)	China IECSC	Japan ENCS	Japan ISHL	Japan PDSCL	Japan PRTR	Philippines PICCS	New Zealand NZIOC	US TSCA
Sulfuric acid, iron(3+) salt (3:2) (10028-22-5)	Yes	Yes	No	No	No	Yes	Yes	Yes
Sulfuric acid (7664-93-9)	Yes	Yes	No	Yes	No	Yes	Yes	Yes

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF PREPARATION OR LAST REVISION

Date of Preparation or Latest Revision : 05/10/2018

Revision Summary

Section	Change	Date Changed
3	HPR Statement	05/10/2018
3	NFPA/HMIS update	05/10/2018

Other Information : This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200 and Canada's Hazardous Products Regulations (HPR).

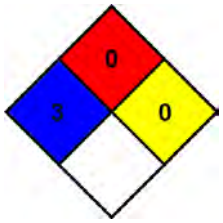
GHS Full Text Phrases:

Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Aquatic Acute 3	Hazardous to the aquatic environment - Acute Hazard Category 3
Eye Dam. 1	Serious eye damage/eye irritation Category 1
Met. Corr. 1	Corrosive to metals Category 1
Skin Corr. 1A	Skin corrosion/irritation Category 1A
Skin Irrit. 2	Skin corrosion/irritation Category 2
H290	May be corrosive to metals
H302	Harmful if swallowed
H314	Causes severe skin burns and eye damage

H315	Causes skin irritation
H318	Causes serious eye damage
H402	Harmful to aquatic life

NFPA 704

NFPA Health Hazard : 3
NFPA Fire Hazard : 0
NFPA Reactivity Hazard : 0



HMIS Rating

Health : 3
Flammability : 0
Physical : 2
PPE See Section 8

Abbreviations and Acronyms

AICS – Australian Inventory of Chemical Substances
ACGIH – American Conference of Governmental Industrial Hygienists
AIHA – American Industrial Hygiene Association
ATE - Acute Toxicity Estimate
BCF - Bioconcentration factor
BEI - Biological Exposure Indices (BEI)
CAS No. - Chemical Abstracts Service number
CERCLA RQ - Comprehensive Environmental Response, Compensation, and Liability Act - Reportable Quantity
CICR - Turkish Inventory and Control of Chemicals
DOT – 49 CFR – US Department of Transportation – Code of Federal Regulations Title 49 – Transportation.
EC50 - Median effective concentration
ECL - Korea Existing Chemicals List
EINECS - European Inventory of Existing Commercial Chemical Substances
ELINCS - European List of Notified Chemical Substances
EmS - IMDG Emergency Schedule Fire & Spillage
ENCS - Japanese Existing and New Chemical Substances Inventory
EPA – Environmental Protection Agency
EPCRA 304 RQ – EPCRA 304 Extremely Hazardous Substance Emergency Planning and Community Right-to-Know-Act – Reportable Quantity
ERAP Index – Emergency Response Assistance Plan Quantity Limit
ErC50 - EC50 in Terms of Reduction Growth Rate
ERG code (IATA) - Emergency Response Drill Code as found in the International Civil Aviation Organization (ICAO)
ERG No. - Emergency Response Guide Number
HCCL - Hazard Communication Carcinogen List
HMIS – Hazardous Materials Information System
IARC - International Agency for Research on Cancer
IATA - International Air Transport Association – Dangerous Goods Regulations
IDLH - Immediately Dangerous to Life or Health
IECSC - Inventory of Existing Chemical Substances Produced or Imported in China
IMDG - International Maritime Dangerous Goods Code
INSQ - Mexican National Inventory of Chemical Substances
ISHL - Japan Industrial Safety and Health Law
LC50 - Median Lethal Concentration
LD50 - Median Lethal Dose
LOAEL - Lowest Observed Adverse Effect Level
LOEC - Lowest-observed-effect Concentration
Log Pow - Octanol/water Partition Coefficient
NFPA 704 – National Fire Protection Association - Standard System for the Identification of the Hazards of Materials for Emergency Response
NIOSH - National Institute for Occupational Safety and Health
NLP - Europe No Longer Polymers List
NOAEL - No-Observed Adverse Effect Level
NOEC - No-Observed Effect Concentration
NZIOC - New Zealand Inventory of Chemicals
OEL - Occupational Exposure Limits
OSHA – Occupational Safety and Health Administration
PEL - Permissible Exposure Limits
PICCS - Philippine Inventory of Chemicals and Chemical Substances
PDSCL - Japan Poisonous and Deleterious Substances Control Law
PPE – Personal Protective Equipment
PRTR - Japan Pollutant Release and Transfer Register
REL - Recommended Exposure Limit
SADT - Self Accelerating Decomposition Temperature
SARA - Superfund Amendments and Reauthorization Act
SARA 302 - Section 302, 40 CFR Part 355
SARA 311/312 - Sections 311 and 312, 40 CFR Part 370 Hazard Categories
SARA 313 - Section 313, 40 CFR Part 372
SRCL - Specifically Regulated Carcinogen List
STEL - Short Term Exposure Limit
SVHC – European Candidate List of Substance of Very High Concern
TDG – Transport Canada Transport of Dangerous Goods Regulations
TLM - Median Tolerance Limit
TLV - Threshold Limit Value
TPQ - Threshold Planning Quantity
TSCA – United StatesToxic Substances Control Act
TWA - Time Weighted Average
WEEL - Workplace Environmental Exposure Levels

Handle product with due care and avoid unnecessary contact. This information is supplied under U.S. OSHA'S "Right to Know" (29 CFR 1910.1200) and Canada's WHMIS regulations. Although certain hazards are described herein, we cannot guarantee these are the only hazards that exist. The information contained herein is based on data available to us and is believed to be true and accurate but it is not offered as a product specification. No warranty, expressed or implied, regarding the accuracy of this data, the hazards connected with the use of the product, or the results to be obtained from the use thereof, is made and Chemtrade and its affiliates assume no responsibility. Chemtrade is a member of the CIAC (Chemistry Industry Association of Canada) and adheres to the codes and principles of Responsible Care™.

Chemtrade NA GHS SDS 2015

SULPHURIC ACID
SAFETY DATA SHEET

SECTION 1. IDENTIFICATION

Product Identity: Sulphuric Acid (93 percent).

Trade Names and Synonyms: Oil of vitriol, electrolyte acid, battery acid, matting acid, H_2SO_4.

Manufacturer:
Teck Metals Ltd.
Trail Operations
Trail, British Columbia
V1R 4L8
Emergency Telephone: 250-364-4214

Supplier:
Teck Metals Ltd.
Trail Operations
Trail, British Columbia
V1R 4L8

Preparer:
Teck Metals Ltd.
Suite 3300 – 550 Burrard Street
Vancouver, British Columbia
V6C 0B3

Date of Last Revision: May 22, 2015.

Date of Last Edit: May 22, 2015.

Product Use: Used in the manufacture of chlorine dioxide (a pulp and paper bleaching chemical), in the manufacture of phosphate and sulphate fertilizers, in the manufacturing of metal sulphates, as a metal pickling chemical and as a component of lead storage batteries.

SECTION 2. HAZARDS IDENTIFICATION

CLASSIFICATION:

Health		Physical	Environmental
Acute Toxicity (Inhalation)	**– Category 2**	**Corrosive to Metals – Category 1**	**Aquatic Toxicity – Short Term – Category 3**
Skin Corrosion	**– Category 1**		
Eye Damage	**– Category 1**		
Specific Target Organ Toxicity			
Acute Exposure	**– Category 3**		
Chronic Exposure	**– Category 2**		

LABEL:

Symbols: 

Signal Word: DANGER

Hazard Statements	Precautionary Statements:
DANGER! Causes severe skin burns and serious eye damage. May cause respiratory irritation. May cause damage to teeth through prolonged and repeated exposure to sulphuric acid mists. Fatal if inhaled. May be corrosive to metals. Harmful to aquatic life.	Wear protective gloves, protective clothing, eye and face protection. Wash exposed skin thoroughly after handling. Store and use only in a well-ventilated area. Keep containers tightly closed. In case of inadequate ventilation wear respiratory protection. Do not breathe mist. Avoid release to the environment. Absorb spillage. IF IN EYES: Rinse continuously with water for several minutes. Continue rinsing and immediately call a poison centre/doctor. Specific treatment is urgent. IF ON SKIN: Take off immediately all contaminated clothing. Rinse skin with water or shower. For large area burns, immediately call a poison centre/doctor. Wash contaminated clothing before reuse. IF INHALED: Remove person to fresh air and keep comfortable for breathing. IF SWALLOWED: Rinse mouth. DO NOT induce vomiting. Get medical attention if you feel unwell. Store in corrosion resistant container with a resistant inner liner.

Emergency Overview: A strong mineral acid present as a colourless and odourless oily liquid when pure but may appear yellow to dark brown when impure. Extremely corrosive to all body tissues, causing rapid tissue destruction and serious chemical burns. Skin or eye contact requires immediate first aid. Can decompose at high temperatures, forming toxic gases such as sulphur oxides. Non-flammable but reacts violently with water, generating large amounts of heat with potential for spattering of the acid. Can react with combustible materials to generate heat and ignition. Reacts with most metals, particularly when diluted with water, to form flammable hydrogen gas which may create an explosion hazard. It is highly toxic to aquatic organisms and plant life.

Potential Health Effects: Sulphuric acid is not very volatile and workplace exposures are therefore primarily due to accidental splashes or to processes or actions that generate an acid mist. It is extremely corrosive to all body tissues, causing rapid tissue destruction and serious chemical burns on contact with the skin or eyes. Skin or eye contact requires immediate first aid. Inhalation of sulphuric acid mist or fumes may produce irritation of the nose, throat and respiratory tract. High levels of acid mist are also irritating to the skin and eyes. Chronic inhalation of acid mist may cause pitting and erosion of tooth enamel. Sulphuric acid, per se, is not listed as a carcinogen by OSHA, NTP, IARC, or the ACGIH. However, IARC, the ACGIH and the NTP have concluded there is sufficient evidence that occupational exposure to strong inorganic acid mists containing sulphuric acid is carcinogenic or potentially carcinogenic to humans (see Toxicological Information, Section 11).

Potential Environmental Effects: Sulphuric acid is highly toxic to aquatic organisms and terrestrial plant life; however, it does not bioaccumulate or bioconcentrate through the food chain (see Ecological Information, Section 12).

SECTION 3. COMPOSITION / INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENTS	CAS Registry No.	CONCENTRATION (% wgt/wgt)
Sulphuric Acid	7664-93-9	93%

Note: See Section 8 for Occupational Exposure Guidelines.

SECTION 4. FIRST AID MEASURES

Eye Contact: *Symptoms:* Burning, pain, blurring. Avoid direct contact. Wear chemical protective gloves, if necessary. Quickly and gently blot excess acid off face. Immediately flush the contaminated eye(s) with lukewarm, gently flowing water, for at least 30 minutes, while holding the eyelid(s) open. If a contact lens is present, DO NOT delay irrigation or attempt to remove the lens. Neutral saline solution may be used as soon as it is available. DO NOT INTERRUPT FLUSHING. If necessary, continue flushing

during transport to emergency care facility. Take care not to rinse contaminated water into the unaffected eye or onto the face. Quickly transport victim to an emergency care facility.

Skin Contact: *Symptoms:* Burning, pain, ulceration. Avoid direct contact. Wear chemical protective clothing if necessary. As quickly as possible, remove contaminated clothing, shoes and leather goods (e.g., watchbands, belts), under shower if possible. Flush with lukewarm, gently flowing water for at least 30 minutes. DO NOT INTERRUPT FLUSHING. For acid splashes over large areas of the body transport quickly to an emergency care facility. If necessary, and if it can be done safely, continue flushing during transport to emergency care facility. Completely decontaminate clothing, shoes and leather goods before reuse or discard.

Inhalation: *Symptoms:* Nose throat and lung irritation, coughing, wheezing. Take precautions to ensure your own safety before attempting rescue (e.g., wear appropriate protective equipment, use the buddy system). Remove source of exposure or move person from exposure area to fresh air and keep comfortable for breathing. Call a Poison Centre/doctor or seek medical attention if you feel unwell.

Ingestion: *Symptoms:* Burning pain in mouth and throat. Have victim rinse mouth thoroughly with water. DO NOT INDUCE VOMITING. If vomiting occurs naturally, have person lie on their side in the recovery position. Have victim rinse mouth with water again. Quickly transport victim to an emergency care facility and bring a copy of this SDS.

SECTION 5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Sulphuric acid is not flammable or combustible. However, fires may result from the heat generated by contact of concentrated sulphuric acid with combustible materials. Sulphuric acid reacts with most metals, especially when diluted with water, to produce hydrogen gas which can accumulate to explosive concentrations inside confined spaces. It reacts violently with water and organic materials evolving a considerable amount of heat and is very hazardous when in contact with carbides, cyanides, and sulfides.

Extinguishing Media: Use dry chemical or carbon dioxide extinguishers to extinguish small fires in surrounding combustible materials. Use water spray or fog to cool fire-exposed containers and to knock down large fires. Use water streams only if absolutely necessary and DO NOT USE WATER DIRECTLY ON ACID as a violent reaction may occur resulting in spattering of the acid. Do not release runoff from fire control methods to sewers or waterways.

Fire Fighting: Fire fighters must be fully-trained and wear full protective clothing including an approved, self-contained breathing apparatus which supplies a positive air pressure within a full face-piece mask. For fires close to a spill or where vapours are present, use acid-resistant personal protective equipment.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Procedures for Cleanup: Control source of release if possible to do so safely. Contain spill, isolate hazard area, and deny entry to unauthorized personnel. Prevent from entering sewage or drainage systems and bodies of water. Dike area around spill and pump uncontaminated acid back to process if possible. Neutralize spilled material with alkali such as sodium carbonate or sodium bicarbonate, soda ash, lime or limestone granules. If neutralized with lime rock or soda ash, good ventilation is required during neutralization because of the release of carbon dioxide gas. Allow to stand for 1-2 hours to complete neutralization, then absorb any liquid in solid absorbent such as vermiculite or clay absorbents. Place spilled material in suitable (corrosion resistant) labeled containers for final disposal. Treat or dispose of waste spilled material and/or contaminated absorbent material in accordance with all local, regional and national regulations.

Personal Precautions: Acid resistant protective clothing and gloves. Sleeves and pant legs should be worn outside, not tucked into gloves and rubber boots. Use close-fitting safety goggles or a combination of safety goggles and a face shield where splashing is a possibility. Respiratory protection equipment should be worn where exposure to hazardous levels of mist or fume is possible.

Environmental Precautions: This product has the potential to pose ecological risks to organisms in both aquatic and terrestrial environments. Discharge of the product to soil and water should be prevented. Prevent spillage from entering sewers or natural watercourses.

SECTION 7. HANDLING AND STORAGE

Store in a dry, cool, well-ventilated area away from incompatible substances. Keep in tightly closed containers which are appropriately labeled. Do not allow contact with water. Do not store near alkaline substances.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational Exposure Guidelines:

Component	ACGIH TLV	OSHA PEL	NIOSH REL
Sulphuric Acid	0.2 mg/m^3 Thoracic fraction	1 mg/m^3	1 mg/m3

NOTE: OEGs for individual jurisdictions may differ from those given above. Check with local authorities for the applicable OEGs in your jurisdiction.
ACGIH - American Conference of Governmental Industrial Hygienists; OSHA - Occupational Safety and Health Administration; NIOSH - National Institute for Occupational Safety and Health. TLV – Threshold Limit Value, PEL – Permissible Exposure Limit, REL – Recommended Exposure Limit.

NOTE: The selection of the necessary level of engineering controls and personal protective equipment will vary depending upon the conditions of use and the potential for exposure. The following are therefore only general guidelines that may not fit all circumstances. Control measures to consider include:

Ventilation: Use adequate local or general ventilation to maintain the concentration of sulphuric acid aerosol mists below recommended occupational exposure limits.

Protective Clothing: Protective clothing and gloves as well as glasses, goggles or face shield. Appropriate protective clothing and gloves should be worn where any possibility exists that skin contact can occur. Use close-fitting safety goggles or a combination of safety goggles and a face shield where any possibility exists that eye contact can occur. An eyewash and quick drench shower should be provided near the work area. Workers should wash immediately whenever skin becomes contaminated.

Respirators: Where sulphuric acid mists are generated and cannot be controlled to within acceptable levels, use appropriate NIOSH-approved respiratory protection equipment (a combination of a 42CFR84 Class N, R or P-100 particulate filter and an acid gas cartridge). Note: sulphuric acid mist also causes eye irritation at high concentrations and a full face respirator or supplied air respirator may be necessary in some cases.

General Hygiene Considerations: Always practice good personal hygiene. Refrain from eating, drinking, or smoking in work areas. Thoroughly wash hands before eating, drinking, or smoking.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:
Clear, colourless, oily liquid (may turn yellowish to amber upon aging)

Odour:
Odourless when cold; acrid odour upon heating

Odour Threshold:
> 1 mg/m³ (Acid mist will irritate the nose and may be sensed as a pungent odour)

pH:
Concentration dependant
<0.1 (93% Sol'n),
0.3 (5% or 1N Sol'n)

Vapour Pressure:
<0.04 kPa (<0.3 mm Hg) @ 25ºC

Vapour Density:
3.4 (air = 1)

Melting Point/Range:
280°C

Boiling Point/Range:
-35°C

Relative Density (Water = 1)**:**
1.84 (93% H_2SO_4)

Evaporation Rate:
Not Applicable

Coefficient of Water/Oil Distribution:
No Data Available

Solubility:
Completely soluble with generation of significant heat.

Flash Point:
Not Flammable

Flammable Limits (LEL/UEL):
Not Applicable

Auto-ignition Temperature:
None

Decomposition Temperature:
Not Applicable

SECTION 10. STABILITY AND REACTIVITY

Stability & Reactivity: Sulphuric acid is stable and not considered reactive under normal temperatures and pressures. Hazardous polymerization or runaway reactions will not occur. Decomposes at 340ºC into sulphur trioxide and water. Extremely reactive with metals, alkalis, reducing agents and many other organic and inorganic chemicals. Hazardous gases such as hydrogen cyanide, hydrogen sulfide and acetylene are evolved on contact with chemicals such as cyanides, sulfides and carbides respectively. Contact with combustible organic matter may cause fire or explosion. Dilution with water generates excessive heat and spattering or boiling may occur. Always add acid to water, NEVER ADD WATER TO ACID. Corrosive to most metals including mild steel, copper, aluminum, zinc, etc., especially when diluted to below 90%.

Incompatibilities: Combustible materials, organic materials, reducing agents, amines, bases, water, excess heat, and metals.

Hazardous Decomposition Products: Sulphur dioxide, sulphur trioxide and sulphuric acid fumes.

SECTION 11. TOXICOLOGICAL INFORMATION

General: Concentrated sulphuric acid is a direct acting toxicant, producing local effects at the site(s) of contact but no systemic effect. It exerts a strong corrosive action on all tissues due to its severe dehydration action (removing water from tissues). The severity of the chemical burn produced by the concentrated acid is proportional to the strength of the acid and the duration of contact. Burns are deep but typically not severely painful.

Acute:
Skin/Eye: Splashes can cause severe eye burns and may cause irreversible eye injury and possible blindness. Skin contact results in severe burns and may result in permanent scarring. High levels of sulphuric acid mists and aerosols are also irritating to the eyes and skin.

Inhalation: Inhalation may cause severe irritation of the respiratory tract with sore throat, coughing, shortness of breath, laryngeal spasm and delayed lung edema. These symptoms may be aggravated by physical exertion. Asthmatics may be more sensitive to inhaling sulphuric acid mists and asthma may be aggravated by exposure to sulphuric acid.

Ingestion: Ingestion is unlikely in industrial use but would result in severe burns to the mouth, throat, esophagus and stomach which could lead to permanent damage to the digestive tract. Small amounts of acid can also enter the lungs during ingestion or subsequent vomiting and cause serious lung injury.

Chronic: Prolonged exposure to dilute solutions or mists may result in eye irritation (chronic conjunctivitis) and produce skin dermatitis. Exposure to high concentrations of acid mist has caused erosion and discolouration of the anterior teeth. Inhalation of sulphuric acid mist may decrease the ability of the respiratory tract to remove other small particles which may be inhaled. Sulphuric acid, per se, is not listed as a carcinogen by OSHA, the National Toxicology Program (NTP), the International Agency for Research on Cancer (IARC), or the ACGIH. IARC has concluded that there is sufficient evidence that occupational exposure to strong inorganic acid mists containing sulphuric acid is carcinogenic to humans, resulting in an increased incidence of primarily laryngeal cancers. The ACGIH lists strong inorganic acid mists containing sulphuric acid as a suspected human carcinogen (A2) and the NTP have classified strong inorganic acid mists containing sulphuric acid as a known human carcinogen. OSHA does not list sulphuric acid mist as a carcinogen.

Animal Toxicity:

Hazardous Ingredient:	Acute Oral Toxicity:	Acute Dermal Toxicity:	Acute Inhalation Toxicity:
Sulphuric Acid	2140 mg/kg†		255 mg/m^3/4Hr‡

† LD_{50}, Rat, Oral, ‡ LC_{50}, Rat, Inhalation, 4 hour

SECTION 12. ECOLOGICAL INFORMATION

Sulphuric acid is highly toxic to aquatic organisms and terrestrial plant life; however, it does not bioaccumulate or bioconcentrate through the food chain.

SECTION 13. DISPOSAL CONSIDERATIONS

Do not wash down drain or allow to reach natural watercourses. Dispose of neutralized waste consistent with regulatory requirements. If neutralized with lime rock or soda ash, good ventilation is required during neutralization because of the release of carbon dioxide gas.

SECTION 14. TRANSPORT INFORMATION

PROPER SHIPPING NAME TRANSPORT CANADA..... Sulphuric Acid
PROPER SHIPPING U.S. DOT..... Sulfuric Acid
TRANSPORT CANADA CLASSIFICATION..... Class 8 Packing Group II
U.S. DOT CLASSIFICATION..... Class 8 Packing Group II (RQ) – 1,000 lbs.
PRODUCT IDENTIFICATION NUMBER..... UN1830
MARINE POLLUTANT..... No
IMO CLASSIFICATION ..... Class 8

SECTION 15. REGULATORY INFORMATION

U.S.

INGREDIENTS LISTED ON TSCA INVENTORY..... Yes

HAZARDOUS UNDER HAZARD COMMUNICATION STANDARD..... Yes

CERCLA SECTION 103 HAZARDOUS SUBSTANCES ..... Sulfuric Acid.....Yes ....RQ: 1000 lbs. (454 kg.)

EPCRA SECTION 302 EXTREMELY HAZARDOUS SUBSTANCE..... Yes .....RQ: 1000 lbs. (454 kg.)
Threshold Planning Quantity: 1000 lbs.

EPCRA SECTION 311/312 HAZARD CATEGORIES..... Immediate (Acute) Health Hazard - Corrosive
Immediate (Acute) Health Hazard - Highly Toxic

EPCRA SECTION 313 TOXIC RELEASE INVENTORY:..... Sulfuric Acid .....CAS NO. 7664-93-9
Percent by Weight: 93%

SECTION 16. OTHER INFORMATION

Date of Original Issue: January 9, 1998 **Version:** 01 *(First edition)*

Date of Latest Revision: May 22, 2015 **Version:** 13

The information in this Safety Data Sheet is based on the following references:

- American Conference of Governmental Industrial Hygienists, 2004, Documentation of the Threshold Limit Values and Biological Exposure Indices, Seventh Edition plus updates.
- American Conference of Governmental Industrial Hygienists, 2015, Guide to Occupational Exposure Values.
- American Conference of Governmental Industrial Hygienists, 2015, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.
- Bretherick's Handbook of Reactive Chemical Hazards, 20th Anniversary Edition. (P. G. Urben, Ed.) 1995.
- Canadian Centre for Occupational Health & Safety CHEMINFO Record No. 122 - Sulphuric Acid, 2009-04.
- Commission de la santé et la sécurité du travail, Service du Répertoire toxicologique, Acide Sulfurique, 2006-02-08.
- Industry Canada, SOR/2015-17, 30 January 2015 - Hazardous Products Regulations.
- International Agency for Research on Cancer (IARC), Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, 1972 – present, (multi-volume work), World Health Organization, Geneva.
- International Chemical Safety Cards (WHO/IPCS/ILO), ICSC:0362 – Sulphuric Acid (Revised Oct 2008).
- Merck & Co., Inc., 2001, The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, Thirteenth Edition.
- National Industrial Chemicals Notification and Assessment Scheme (NICNAS), Sydney, Australia – Existing Chemicals Information Sheet – Sulphuric Acid, 30 June 2003.
- OECD Screening Information Data Base (SIDS) Initial Assessment Report – Sulphuric Acid, January 2001.
- Patty's Toxicology, Fifth Edition, 2001: E. Bingham, B. Cohrssen & C.H. Powell, Ed.
- Toxicology of the Eye, 2nd Ed. W. Morton Grant, MD, Charles C. Thomas, Publishers; Springfield. IL (1974).
- U.S. Dept. of Health and Human Services, National Institute for Occupational Safety and Health. NIOSH Pocket Guide to Chemical Hazards. CD-ROM Edition September 2005.
- U.S. Dept. of Health and Human Services, National Institute for Occupational Safety and Health, Registry of Toxic Effects of Chemical Substances (RTECS) CCOHS Web Access subscription.
- U.S. Dept. of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Sulfur Trioxide and Sulfuric Acid, December 1998.
- U.S. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.

Notice to Reader

Although reasonable precautions have been taken in the preparation of the data contained herein, it is offered solely for your information, consideration and investigation. Teck Metals Ltd. extends no warranty and assumes no responsibility for the accuracy of the content and expressly disclaims all liability for reliance thereon. This safety data sheet provides guidelines for the safe handling and processing of this product; it does not and cannot advise on all possible situations. Therefore, your specific use of this product should be evaluated to determine if additional precautions are required. Individuals exposed to this product should read and understand this information and be provided pertinent training prior to working with this product.

Hydrochloric Acid MSDS

Effective Date: December 03, 2012
24 Hour Emergency Contact:
ChemTel: (800)255-3924
www.pioneerforensics.com

1. PRODUCT AND COMPANY IDENTIFICATION

Product:	**Hydrochloric Acid**
Product Number(s):	PF021, PF022
CAS#:	7647-01-0
Synonyms:	Muriatic acid; Hydrogen chloride, aqueous; Chlorohydric acid
Manufacturer:	Pioneer Forensics, LLC 804 E. Eisenhauer Blvd. Loveland, CO 80537 Ph: (970) 292-8487
Emergency Number:	(800) 255-3924 (CHEM-TEL)
Customer Service:	(970) 292-8487

2. HAZARDS IDENTIFICATION

Emergency Overview: DANGER! Corrosive. Causes severe skin, eye, and digestive tract burns. Harmful if swallowed. Mist or vapor extremely irritating to eyes and respiratory tract.

Safety Ratings:

Health: 3, Severe	Reactivity: 1, Slight
Flammability: 0, None	Contact: 4, Extreme

OSHA Regulatory Status: This product is considered a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Potential Acute Health Effects:

Routes of Exposure: Inhalation, ingestion, skin contact, eye contact

Inhalation: Corrosive. May cause damage to mucous membranes in nose, throat, lungs and bronchial system.

Ingestion: Corrosive. Harmful if swallowed. May produce burns to the lips, oral cavity, upper airway, esophagus and digestive tract.

Skin Contact: Corrosive. Causes severe burns.

Eye Contact: Corrosive. Causes severe burns. Vapor or spray may cause eye damage, impaired sight or blindness.

Target Organs: Skin, respiratory system, eyes, lungs

Chronic Health Effects: Corrosive. Prolonged contact causes serious tissue damage.

Aggravation of:
Medical Conditions: Repeated or prolonged exposure to the substance can produce target organs damage. Persons with pre-existing skin disorders or eye problems may be more susceptible to the effects of the substance.

Potential Environmental Effects: May affect the acidity (pH) in water with risk of harmful effects to aquatic organisms.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Components	CAS#	Chemical Formula	Formula Weight	Hazardous	% by Weight
Hydrochloric Acid	7647-01-0	HCl	36.46	Yes	36.5 - 38.0
Water	7732-18-5	H_2O	18.02	No	62.0 - 63.5

4. FIRST AID MEASURES

First Aid Procedures:

Inhalation: Remove to fresh air. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Get medical attention immediately.

Ingestion: Do not induce vomiting. If vomiting occurs, keep head low so that vomit does not enter lungs. Never give anything by mouth to an unconscious person. GET MEDICAL ATTENTION IMMEDIATELY.

Skin Contact: Flush affected area with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. Get medical attention immediately.

Eye Contact: Check for and remove contact lenses. Immediately flush eyes with gentle but large stream of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

General Advice: In the case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance.

Notes to Physician: Treat symptomatically. Keep victim under observation.

5. FIRE FIGHTING MEASURES

NFPA Ratings: Health: 3 Flammability: 0 Reactivity: 1

Flammable Properties: The material is not flammable.

Flash Point: Not applicable

Auto-ignition Temp: Not applicable

Flammable Limits in Air (% by volume): Not applicable

Suitable Extinguishing Media: Water, dry powder, foam, carbon dioxide

Unsuitable Extinguishing Media: No information found

Hazardous Combustion Products:	Hydrogen chloride. Chlorine. May decompose upon heating to produce corrosive and/or toxic fumes.
Specific Hazards:	Fire may produce irritating, corrosive, and/or toxic gases.
Special Protective Equipment For Firefighters:	As in any fire, wear MSHA/NIOSH approved (or equivalent) self-contained positive pressure or pressure-demand breathing apparatus and full protective gear.
Specific Methods:	Use water spray to cool unopened containers. Cool containers exposed to flames with flooding quantities of water until well after the fire is out. In the event of fire and/or explosion do not breathe fumes.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions:	Ventilate area of leak or spill. Isolate hazard area and keep unnecessary and unprotected personnel away from the area of the leak or spill. Keep upwind. Keep out of low areas. Wear appropriate personal protective equipment as specified in the Exposure Control and Personal Protection Section 8. Avoid contact with eyes, skin, and clothing.
Environmental Precautions:	Prevent further leakage or spillage if safe to do so. Do not contaminate water. Avoid discharge into drains, water courses or onto the ground. In case of large spill, dike if needed.
Methods for Containment:	Stop the flow of material, if this is without risk. Prevent entry into waterways, sewer, basements or confined areas. Dike the spilled material, where this is possible.
Methods for Cleaning Up:	Absorb spill with an inert material (e.g. vermiculite, dry sand, earth, cloth, fleece), and place in a suitable non-combustible container for reclamation or disposal. Do not use combustible materials, such as sawdust. Clean contaminated surface thoroughly. Neutralize spill area and washings with soda ash or lime. Never return spills in original containers for re-use. Clean up in accordance with all applicable regulations.

7. HANDLING AND STORAGE

Handling:	Wear personal protective equipment (see section 8). Use only in well-ventilated areas. Provide sufficient air exchange and/or exhaust in work rooms. Avoid contact with skin, eyes and clothing. Do not breathe vapors or spray mist. Do not ingest. When using, do not eat, smoke, or drink. Keep away from incompatible materials. Handle in accordance with good industrial hygiene and safety practice. Wash thoroughly after handling. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquids). Observe all warnings and precautions listed for the product Use caution when combining with water. DO NOT add water to acid. ALWAYS add acid to water while stirring to prevent release of heat, steam, and fumes.
Storage:	Store in a cool, dry, ventilated area away from incompatible materials. Store in original container. Keep containers tightly closed and upright. Keep away from food, drink and animal feedingstuffs. Keep out of the reach of children.

8. EXPOSURE CONTROL AND PERSONAL PROTECTION

Exposure Limits:	ACGIH:	Ceiling: 2 ppm
	OSHA:	Ceiling: 5 ppm 7 mg/m^3
Engineering Controls:	Ensure adequate ventilation. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls	

to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Explosion proof exhaust ventilation should be used.

Personal Protective Equipment:

Eye/Face Protection: Wear safety glasses with side shields or goggles and a face shield.

Skin Protection: Wear appropriate chemical resistant clothing (with long sleeves) and appropriate chemical resistant gloves.

Respiratory Protection: If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn. Respirator type: Chemical respirator with acid gas cartridge. Use a positive-pressure air-supplied respirator if there is any potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air-purifying respirators may not provide adequate protection.

General Hygiene Considerations: Avoid contact with skin, eyes and clothing. When using, do not eat, drink or smoke. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Provide eyewash station and safety shower.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Appearance:	Transparent
Color:	Colorless
Odor:	Pungent, irritating
Molecular Formula:	HCl
Molecular Weight:	36.46
pH:	0.1 (1.0 N Solution)
Specific Gravity:	1.18
Freezing/Melting Point:	-25 °C (-13 °F)
Boiling Point:	50.5 °C (123 °F)
Flash Point:	Not applicable
Auto Ignition Temperature:	Not applicable
Flammable Limits in Air (% by Volume):	
Upper:	Not applicable
Lower:	
Solubility:	Miscible with water
Vapor Pressure:	25 kPa at 25°C (estimate)
Vapor Density:	1.3 (estimate)
Odor threshold (ppm):	0.25-10 ppm
Evaporation Rate:	No information found
Partition Coefficient (n-octanol/water):	No information found

10. STABILITY AND REACTIVITY

Stability: Stable under normal conditions.

Conditions to Avoid: Incompatibles

Incompatible Materials: Bases, metals, oxidizing agents, acids, amines, reducing agents, organic materials

Hazardous Decomposition Products:	Hydrogen chloride, chlorine. May decompose upon heating to product corrosive and/or toxic fumes.
Possibility of Hazardous Reactions:	Can react vigorously, violently or explosively with incompatible materials listed above.
Hazardous Polymerization:	Will not occur.

11. TOXICOLOGICAL INFORMATION

Toxicological Data:	Oral Rat LD50:	240 mg/kg (estimate)
	Oral Rabbit LD50:	900 mg/kg
	Inhalation Rat LC50:	3124 mg/L 1 H
Acute Effects:	Strongly corrosive. May cause deep tissue damage. Harmful if swallowed.	
Local Effects:	Causes severe burns. Mist or vapor extremely irritating to eyes and respiratory tract.	
Sensitization:	Not a skin sensitizer.	
Chronic Effects:	Corrosive. Prolonged or repeated skin contact causes serious tissue damage.	
Carcinogenic Effects:	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.	
	ACGIH:	A4 – Not classifiable as a human carcinogen
	IARC:	3 – Not classifiable as to carcinogenicity of humans
Skin Corrosion/Irritation:	Corrosive to skin and eyes.	
Epidemiology:	No epidemiological data is available for this product.	
Mutagenicity:	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.	
Neurological Effects:	No information found.	
Reproductive Effects:	Contains no ingredient listed as toxic to reproduction.	
Teratogenic Effects:	No data available to indicate product or any components present at greater than 0.1% may cause birth defects.	
Target Organs and Symptoms:	Corrosive effects. Mucus membranes, skin, eyes, kidneys, liver, respiratory tract	

12. ECOLOGICAL INFORMATION

Ecotoxicological Data:	LC50 Western mosquitofish (Gambusia affinis):	282 mg/L 96 H
Ecotoxicity:	This product may affect the acidity (pH) in water with risk of harmful effects to aquatic organisms.	
Environmental Effects:	An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.	
Persistence and Degradability:	Expected to be readily biodegradable.	

Partition Coefficient (n-octanol/water): No information found.

13. DISPOSAL INFORMATION

Disposal Instructions: Dispose of this material and its container to hazardous or special waste collection point. Incinerate the material under controlled conditions in an approved incinerator. All wastes must be handled in accordance with local, state and federal regulations.

Contaminated Packaging: Since emptied containers retain product residue, follow label warnings even after container is emptied. Offer rinsed packaging material to local recycling facilities.

Waste Codes: D002: Waste corrosive material (pH ≤ 2 or pH ≥12.5, or corrosive to steel)

14. TRANSPORT INFORMATION

DOT:

UN Number: UN1789

Proper Shipping Name: Hydrochloric Acid

Hazard Class: 8

Packaging Group: II

ERG Number: 157

15. REGULATORY INFORMATION

U.S. Federal Regulations:

OSHA: This product is considered a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Inventory: Hydrochloric Acid; Water

U.S. EPCRA (SARA Title III):

Sections 311/312:

Hazard Categories	List (Yes/No)
Section 311 – Hazardous Chemical	Yes
Immediate Hazard	Yes
Delayed Hazard	No
Fire Hazard	No
Pressure Hazard	No
Reactivity Hazard	No

Section 302:

Extremely Hazardous Substance:	Hydrochloric Acid
Reportable Quantity:	5000 lbs
Threshold Planning Quantity:	500 lbs

Section 313: Toxic chemical or category: Hydrochloric Acid

	De minimis concentration:	1.0%
CERCLA:	Hydrochloric Acid:	5000 lbs

International Inventories:

Country(s) or Region	Inventory Name	On Inventory (Yes/No)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes

*A "Yes" indicates that the listed component(s) of this product comply with the inventory requirements administered by the governing country(s)

16. OTHER INFORMATION

Product Use: Laboratory and/or field reagent

Disclaimer: Pioneer Forensics LLC provides the information in this Material Safety Data Sheet in the belief that it is reliable but assumes no responsibility for its completeness or accuracy. The physical properties reported in this MSDS are obtained from the literature and do not constitute product specifications. Pioneer Forensics LLC makes and gives no representations or warranties with respect to the information contained herein or the product to which it refers, whether express, implied, or statutory, including without limitation, warranties of accuracy, completeness, merchantability, non-infringement, performance, safety, suitability, stability, and fitness for a particular purpose. No warranty against infringement of any patent, copyright or trademark is made or implied. This MSDS is intended only as a guide to the appropriate handling of the material by a properly trained person. It shall be the user's responsibility to develop proper methods of handling and personal protection based on the actual conditions of use. Accordingly, Pioneer Forensics LLC assumes no liability whatsoever for the use of or reliance upon this information including results obtained, incidental or consequential damages, or lost profits.

Issue Date: 12/03/2012

Reason for Revision: Not applicable

Ammonium Hydroxide, ACS

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 07/06/1998 Revision date: 11/21/2016 Supersedes: 12/29/2015 Version: 2.0

SECTION 1: Identification

1.1. Identification

Product form	:	Substance
Substance name	:	Ammonium Hydroxide, ACS
CAS-No.	:	1336-21-6
Product code	:	LC11050
Formula	:	NH4OH
Synonyms	:	ammonia hydrate, 28%-30% / ammonia,liquor,25%<=conc<35% / ammonia, solutions, 28%-30% / ammoniawater, 28%-30% / aqua ammonia, solution, 28%-30% / spirit of hartshorn, 28%-30%

1.2. Recommended use and restrictions on use

Use of the substance/mixture	:	Chemical raw material Food industry: additive Solvent

1.3. Supplier

LabChem Inc
Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court
Zelienople, PA 16063 - USA
T 412-826-5230 - F 724-473-0647
info@labchem.com - www.labchem.com

1.4. Emergency telephone number

Emergency number	:	CHEMTREC: 1-800-424-9300 or 011-703-527-3887

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

GHS-US classification

Acute toxicity (oral) Category 4	H302	Harmful if swallowed
Acute toxicity (inhalation:vapour) Category 4	H332	Harmful if inhaled
Skin corrosion/irritation Category 1C	H314	Causes severe skin burns and eye damage
Serious eye damage/eye irritation Category 1	H318	Causes serious eye damage
Hazardous to the aquatic environment - Acute Hazard Category 1	H400	Very toxic to aquatic life

Full text of H statements : see section 16

2.2. GHS Label elements, including precautionary statements

GHS-US labeling

Hazard pictograms (GHS-US) :

GHS05 GHS07 GHS09

Signal word (GHS-US) : Danger

Hazard statements (GHS-US) :
H302+H332 - Harmful if swallowed or if inhaled
H314 - Causes severe skin burns and eye damage
H400 - Very toxic to aquatic life

Precautionary statements (GHS-US) :
P260 - Do not breathe mist, spray, vapors.
P264 - Wash exposed 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 eye protection, face protection, protective clothing, protective gloves.

P301+P330+P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303+P361+P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a poison center or doctor/physician.
P363 - Wash contaminated clothing before reuse.
P391 - Collect spillage.
P405 - Store locked up.
P501 - Dispose of contents/container to comply with local, state and federal regulations
If inhaled: Remove person to fresh air and keep comfortable for breathing

2.3. Other hazards which do not result in classification

Other hazards not contributing to the classification : None.

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/Information on ingredients

3.1. Substances

Substance type : Multi-constituent

Name : Ammonium Hydroxide, ACS

CAS-No. : 1336-21-6

Name	Product identifier	%	GHS-US classification
Water	(CAS-No.) 7732-18-5	72	Not classified
Ammonia	(CAS-No.) 7664-41-7	28	Flam. Gas 2, H221 Press. Gas (Comp.), H280 Acute Tox. 3 (Inhalation), H331 Skin Corr. 1B, H314 Aquatic Acute 1, H400

Full text of hazard classes and H-statements : see section 16

3.2. Mixtures

Not applicable

SECTION 4: First-aid measures

4.1. Description of first aid measures

First-aid measures general : Check the vital functions. Unconscious: maintain adequate airway and respiration. Respiratory arrest: artificial respiration or oxygen. Cardiac arrest: perform resuscitation. Victim conscious with labored breathing: half-seated. Victim in shock: on his back with legs slightly raised. Vomiting: prevent asphyxia/aspiration pneumonia. Prevent cooling by covering the victim (no warming up). Keep watching the victim. Give psychological aid. Keep the victim calm, avoid physical strain. Depending on the victim's condition: doctor/hospital.

First-aid measures after inhalation : Remove the victim into fresh air. Respiratory problems: consult a doctor/medical service.

First-aid measures after skin contact : Wash immediately with lots of water (15 minutes)/shower. Do not apply (chemical) neutralizing agents. Remove clothing while washing. Do not remove clothing if it sticks to the skin. Cover wounds with sterile bandage. Consult a doctor/medical service. If burned surface > 10%: take victim to hospital.

First-aid measures after eye contact : Rinse immediately with plenty of water for 15 minutes. Cover eyes aseptically. Do not apply neutralizing agents. Take victim to an ophthalmologist.

First-aid measures after ingestion : Rinse mouth with water. Immediately after ingestion: give lots of water to drink. Do not induce vomiting. Immediately consult a doctor/medical service. Call Poison Information Centre (www.big.be/antigif.htm). Take the container/vomit to the doctor/hospital. Ingestion of large quantities: immediately to hospital.

4.2. Most important symptoms and effects (acute and delayed)

Symptoms/effects : Not expected to present a significant hazard under anticipated conditions of normal use.

Symptoms/effects after inhalation : Dry/sore throat. Coughing. Irritation of the respiratory tract. Irritation of the nasal mucous membranes. Nausea. Headache. EXPOSURE TO HIGH CONCENTRATIONS: Possible oedema of the upper respiratory tract. Possible inflammation of the respiratory tract. Possible laryngeal spasm/oedema. FOLLOWING SYMPTOMS MAY APPEAR LATER: Risk of lung edema. Risk of pneumonia. Respiratory difficulties. Possible esophageal perforation.

Symptoms/effects after skin contact : Caustic burns/corrosion of the skin.

Symptoms/effects after eye contact : Irritation of the eye tissue. Permanent eye damage.

Symptoms/effects after ingestion	:	Risk of aspiration pneumonia. Nausea. Vomiting. AFTER ABSORPTION OF LARGE QUANTITIES: Blue/grey discoloration of the skin. Blood in stool. Blood in vomit. Possible esophageal perforation. FOLLOWING SYMPTOMS MAY APPEAR LATER: Shock.
Chronic symptoms	:	ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Coughing. Irritation of the respiratory tract. Irritation of the eye tissue. Redness of the eye tissue. Possible inflammation of the respiratory tract. Respiratory difficulties. Affection of the nasal septum.

4.3. Immediate medical attention and special treatment, if necessary

Obtain medical assistance.

SECTION 5: Fire-fighting measures

5.1. Suitable (and unsuitable) extinguishing media

Suitable extinguishing media	:	Adapt extinguishing media to the environment.
Unsuitable extinguishing media	:	No unsuitable extinguishing media known.

5.2. Specific hazards arising from the chemical

Fire hazard	:	DIRECT FIRE HAZARD. Non combustible.
Explosion hazard	:	INDIRECT EXPLOSION HAZARD. Reactions with explosion hazards: see "Reactivity Hazard".
Reactivity	:	On heating: release of toxic/corrosive/combustible gases/vapours (ammonia). On burning: release of toxic and corrosive gases/vapours (nitrous vapours). Concentrated solution violent to explosive reaction with many compounds e.g.: with (some) halogens compounds, with (strong) oxidizers and with (some) acids.

5.3. Special protective equipment and precautions for fire-fighters

Firefighting instructions	:	Cool tanks/drums with water spray/remove them into safety. Do not move the load if exposed to heat. Dilute toxic gases with water spray. Take account of toxic fire-fighting water. Use water moderately and if possible collect or contain it.
Protection during firefighting	:	Do not enter fire area without proper protective equipment, including respiratory protection.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Protective equipment	:	Gas-tight suit. Corrosion-proof suit. See "Material-Handling" to select protective clothing.
Emergency procedures	:	Keep upwind. Mark the danger area. Consider evacuation. Close doors and windows of adjacent premises. No naked flames. Keep containers closed. Wash contaminated clothes.

6.1.2. For emergency responders

Protective equipment	:	Equip cleanup crew with proper protection.
Emergency procedures	:	Stop leak if safe to do so. Ventilate area.

6.2. Environmental precautions

Prevent soil and water pollution. Prevent spreading in sewers.

6.3. Methods and material for containment and cleaning up

For containment	:	Contain released substance, pump into suitable containers. Consult "Material-handling" to select material of containers. Plug the leak, cut off the supply. Dam up the liquid spill. Try to reduce evaporation. Dilute toxic gases/vapours with water spray. Take account of toxic/corrosive precipitation water.
Methods for cleaning up	:	Damaged/cooled tanks must be emptied. Take up liquid spill into absorbent material, e.g.: sand/earth or powdered limestone. Scoop absorbed substance into closing containers. See "Material-handling" for suitable container materials. Carefully collect the spill/leftovers. Take collected spill to manufacturer/competent authority. Clean contaminated surfaces with an excess of water. Wash clothing and equipment after handling.

6.4. Reference to other sections

See Heading 8. Exposure controls and personal protection.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling	:	Comply with the legal requirements. Remove contaminated clothing immediately. Clean contaminated clothing. Use corrosionproof equipment. Thoroughly clean/dry the installation before use. Do not discharge the waste into the drain. Keep away from naked flames/heat. Observe strict hygiene. Keep container tightly closed. Measure the concentration in the air regularly. Carry operations in the open/under local exhaust/ventilation or with respiratory protection. Exhaust gas must be neutralised.

Hygiene measures : Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Wash contaminated clothing before reuse.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions : Keep container closed when not in use. Keep only in the original container in a cool, well ventilated place away from :

Incompatible products : Strong acids. silver nitrate. Strong bases.

Incompatible materials : Sources of ignition. Direct sunlight.

Maximum storage period : 365 days

Storage temperature : < 38 °C

Heat-ignition : KEEP SUBSTANCE AWAY FROM: heat sources.

Prohibitions on mixed storage : KEEP SUBSTANCE AWAY FROM: oxidizing agents. strong acids. halogens.

Storage area : Store at ambient temperature. Keep out of direct sunlight. Store in a dark area. Keep container in a well-ventilated place. Keep locked up. Provide for a tub to collect spills. Meet the legal requirements.

Special rules on packaging : SPECIAL REQUIREMENTS: closing. clean. opaque. correctly labelled. meet the legal requirements. Secure fragile packagings in solid containers.

Packaging materials : SUITABLE MATERIAL: synthetic material. glass. MATERIAL TO AVOID: aluminium. copper. tin. zinc. nickel. bronze.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Ammonium Hydroxide, ACS (1336-21-6)		
ACGIH	ACGIH TWA (mg/m³)	17 mg/m³
ACGIH	ACGIH STEL (mg/m³)	24 mg/m³
OSHA	OSHA PEL (TWA) (mg/m³)	35 mg/m³
OSHA	OSHA PEL (TWA) (ppm)	50 ppm
IDLH	US IDLH (ppm)	300 ppm
NIOSH	NIOSH REL (TWA) (mg/m³)	18 mg/m³
NIOSH	NIOSH REL (TWA) (ppm)	25 ppm
NIOSH	NIOSH REL (STEL) (mg/m³)	27 mg/m³
NIOSH	NIOSH REL (STEL) (ppm)	35 ppm

Water (7732-18-5)
Not applicable

Ammonia (7664-41-7)		
ACGIH	ACGIH TWA (mg/m³)	17 mg/m³
ACGIH	ACGIH TWA (ppm)	25 ppm
ACGIH	ACGIH STEL (mg/m³)	24 mg/m³
ACGIH	ACGIH STEL (ppm)	25 ppm
OSHA	OSHA PEL (TWA) (mg/m³)	35 mg/m³
OSHA	OSHA PEL (TWA) (ppm)	50 ppm
IDLH	US IDLH (ppm)	300 ppm
NIOSH	NIOSH REL (TWA) (mg/m³)	18 mg/m³
NIOSH	NIOSH REL (TWA) (ppm)	25 ppm
NIOSH	NIOSH REL (STEL) (mg/m³)	27 mg/m³
NIOSH	NIOSH REL (STEL) (ppm)	35 ppm

8.2. Appropriate engineering controls

Appropriate engineering controls : Provide adequate general and local exhaust ventilation. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.

8.3. Individual protection measures/Personal protective equipment

Personal protective equipment:

Avoid all unnecessary exposure. Corrosionproof clothing. Face shield. High gas/vapor concentration: gas mask. Gloves. Safety glasses.

Materials for protective clothing:

GIVE EXCELLENT RESISTANCE: butyl rubber. GIVE GOOD RESISTANCE: neoprene. nitrile rubber. viton. tetrafluoroethylene. GIVE LESS RESISTANCE: PVC. GIVE POOR RESISTANCE: natural rubber. polyethylene. PVA

Hand protection:

Gloves

Eye protection:

Safety glasses

Skin and body protection:

Head/neck protection. Corrosion-proof clothing

Respiratory protection:

Gas mask with filter type K. High vapour/gas concentration: self-contained respirator

Thermal hazard protection:

None necessary.

Other information:

Do not eat, drink or smoke during use.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	:	Liquid
Appearance	:	Liquid.
Color	:	Colourless
Odor	:	Irritating/pungent odour
Odor threshold	:	5 - 50 ppm
pH	:	11.7 (3.5 %)
pH solution	:	3.5 %
Melting point	:	No data available
Freezing point	:	No data available
Boiling point	:	27 °C
Flash point	:	Not applicable
Relative evaporation rate (butyl acetate=1)	:	No data available
Flammability (solid, gas)	:	Non flammable.
Vapor pressure	:	No data available
Relative vapor density at 20 °C	:	No data available
Relative density	:	0.88 - 0.91
Specific gravity / density	:	0.89
Molecular mass	:	35.05 g/mol
Solubility	:	Water: Complete
Log Pow	:	-1.3
Auto-ignition temperature	:	Not applicable
Decomposition temperature	:	No data available

Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	No data available
Explosion limits	:	No data available
Explosive properties	:	No data available
Oxidizing properties	:	No data available

9.2. Other information

Minimum ignition energy	:	Not applicable
VOC content	:	Not applicable
Other properties	:	Clear. Physical properties depending on the concentration. Volatile. Substance has basic reaction.

SECTION 10: Stability and reactivity

10.1. Reactivity

On heating: release of toxic/corrosive/combustible gases/vapours (ammonia). On burning: release of toxic and corrosive gases/vapours (nitrous vapours). Concentrated solution violent to explosive reaction with many compounds e.g.: with (some) halogens compounds, with (strong) oxidizers and with (some) acids.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

Reacts vigorously with strong oxidizers and acids.

10.4. Conditions to avoid

High temperature. Incompatible materials. Direct sunlight. Extremely high or low temperatures.

10.5. Incompatible materials

May react violently with acids. Strong acids. Strong bases.

10.6. Hazardous decomposition products

Gaseous ammonia. fume. Carbon monoxide. Carbon dioxide.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Likely routes of exposure	:	Inhalation; Skin and eye contact
Acute toxicity	:	Oral: Harmful if swallowed. Inhalation:vapour: Harmful if inhaled.

Ammonium Hydroxide, ACS (1336-21-6)	
LD50 oral rat	350 mg/kg
ATE US (oral)	350 mg/kg body weight
ATE US (vapors)	10.714 mg/l/4h

Water (7732-18-5)	
LD50 oral rat	≥ 90000 mg/kg
ATE US (oral)	90000 mg/kg body weight

Ammonia (7664-41-7)	
ATE US (gases)	700 ppmV/4h
ATE US (vapors)	3 mg/l/4h
ATE US (dust, mist)	0.5 mg/l/4h

Skin corrosion/irritation	:	Causes severe skin burns and eye damage. pH: 11.7 (3.5 %)
Serious eye damage/irritation	:	Causes serious eye damage. pH: 11.7 (3.5 %)
Respiratory or skin sensitization	:	Not classified
Germ cell mutagenicity	:	Not classified
Carcinogenicity	:	Not classified
Reproductive toxicity	:	Not classified
Specific target organ toxicity – single exposure	:	Not classified

Specific target organ toxicity – repeated exposure	:	Not classified
Aspiration hazard	:	Not classified
Potential Adverse human health effects and symptoms	:	Based on available data, the classification criteria are not met.
Symptoms/effects after inhalation	:	Dry/sore throat. Coughing. Irritation of the respiratory tract. Irritation of the nasal mucous membranes. Nausea. Headache. EXPOSURE TO HIGH CONCENTRATIONS: Possible oedema of the upper respiratory tract. Possible inflammation of the respiratory tract. Possible laryngeal spasm/oedema. FOLLOWING SYMPTOMS MAY APPEAR LATER: Risk of lung edema. Risk of pneumonia. Respiratory difficulties. Possible esophageal perforation.
Symptoms/effects after skin contact	:	Caustic burns/corrosion of the skin.
Symptoms/effects after eye contact	:	Irritation of the eye tissue. Permanent eye damage.
Symptoms/effects after ingestion	:	Risk of aspiration pneumonia. Nausea. Vomiting. AFTER ABSORPTION OF LARGE QUANTITIES: Blue/grey discoloration of the skin. Blood in stool. Blood in vomit. Possible esophageal perforation. FOLLOWING SYMPTOMS MAY APPEAR LATER: Shock.
Chronic symptoms	:	ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Coughing. Irritation of the respiratory tract. Irritation of the eye tissue. Redness of the eye tissue. Possible inflammation of the respiratory tract. Respiratory difficulties. Affection of the nasal septum.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general	:	Dangerous for the environment.
Ecology - air	:	Not classified as dangerous for the ozone layer (Regulation (EC) No 1005/2009).
Ecology - water	:	Water pollutant (surface water). Affects the self-cleaning capacity of surface water. Ground water pollutant. Maximum concentration in drinking water: 0.50 mg/l (ammonium) (Directive 98/83/EC). Highly toxic to fishes. Toxic to invertebrates (Daphnia). May cause eutrophication. Highly toxic to plankton. pH shift. Inhibition of activated sludge.

Ammonium Hydroxide, ACS (1336-21-6)	
LC50 fish 1	0.16 - 1.1 mg/l (LC50; 96 h)
EC50 Daphnia 1	2.08 mg/l (LC50; 48 h)

12.2. Persistence and degradability

Ammonium Hydroxide, ACS (1336-21-6)	
Persistence and degradability	Readily biodegradable in water. Ozonation in water. Biodegradable in the soil. No test data on mobility of the components available. Ozonation in the air.

Water (7732-18-5)	
Persistence and degradability	Not established.

Ammonia (7664-41-7)	
Persistence and degradability	Not established.

12.3. Bioaccumulative potential

Ammonium Hydroxide, ACS (1336-21-6)	
Log Pow	-1.3
Bioaccumulative potential	Bioaccumulation: not applicable.

Water (7732-18-5)	
Bioaccumulative potential	Not established.

Ammonia (7664-41-7)	
Bioaccumulative potential	Not established.

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

Other information	:	Avoid release to the environment.

SECTION 13: Disposal considerations

13.1. Disposal methods

Waste disposal recommendations : Remove waste in accordance with local and/or national regulations. Hazardous waste shall not be mixed together with other waste. Different types of hazardous waste shall not be mixed together if this may entail a risk of pollution or create problems for the further management of the waste. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals. Recycle/reuse. Remove for physico-chemical/biological treatment. Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber with energy recovery. Use appropriate containment to avoid environmental contamination.

Additional information : LWCA (the Netherlands): KGA category 02. Hazardous waste according to Directive 2008/98/EC.

Ecology - waste materials : Avoid release to the environment.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description : UN2672 Ammonia solutions (relative density between 0.880 and 0.957 at 15 degrees C in water, with more than 10 percent but not more than 35 percent ammonia), 8, III

UN-No.(DOT) : UN2672

Proper Shipping Name (DOT) : Ammonia solutions

relative density between 0.880 and 0.957 at 15 degrees C in water, with more than 10 percent but not more than 35 percent ammonia

Transport hazard class(es) (DOT) : 8 - Class 8 - Corrosive material 49 CFR 173.136

Packing group (DOT) : III - Minor Danger

Hazard labels (DOT) : 8 - Corrosive

Dangerous for the environment : Yes

Marine pollutant : Yes

DOT Packaging Non Bulk (49 CFR 173.xxx) : 203

DOT Packaging Bulk (49 CFR 173.xxx) : 241

DOT Special Provisions (49 CFR 172.102) : IB3 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1 and 31HA2, 31HB2, 31HN2, 31HD2 and 31HH2). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized, except for UN2672 (also see Special Provision IP8 in Table 2 for UN2672).
IP8 - Ammonia solutions may be transported in rigid or composite plastic IBCs (31H1, 31H2 and 31HZ1) that have successfully passed, without leakage or permanent deformation, the hydrostatic test specified in 178.814 of this subchapter at a test pressure that is not less than 1.5 times the vapor pressure of the contents at 55 C (131 F).
T7 - 4 178.274(d)(2) Normal..... 178.275(d)(3)
TP1 - The maximum degree of filling must not exceed the degree of filling determined by the following: Degree of filling = 97 / 1 + a (tr - tf) Where: tr is the maximum mean bulk temperature during transport, and tf is the temperature in degrees celsius of the liquid during filling.

DOT Packaging Exceptions (49 CFR 173.xxx) : 154

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 5 L

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 60 L

DOT Vessel Stowage Location	:	A - The material may be stowed ‘‘on deck’’ or ‘‘under deck’’ on a cargo vessel and on a passenger vessel.
DOT Vessel Stowage Other	:	40 - Stow ‘‘clear of living quarters’’,52 - Stow ‘‘separated from’’ acids,85 - Under deck stowage must be in mechanically ventilated space
Other information	:	No supplementary information available.

Transport by sea

Transport document description (IMDG)	:	UN 2672 Ammonia solutions (relative density between 0.880 and 0.957 at 15 degrees C in water, with more than 10 percent but not more than 35 percent ammonia), 8, MARINE POLLUTANT/ENVIRONMENTALLY HAZARDOUS
UN-No. (IMDG)	:	2672
Proper Shipping Name (IMDG)	:	Ammonia solutions
Class (IMDG)	:	8 - Corrosive substances
EmS-No. (1)	:	F-A
EmS-No. (2)	:	S-B
Marine pollutant	:	Yes

Air transport

Transport document description (IATA)	:	UN 2672 Ammonia solutions (relative density between 0.880 and 0.957 at 15 degrees C in water, with more than 10 percent but not more than 35 percent ammonia), 8, III, ENVIRONMENTALLY HAZARDOUS
UN-No. (IATA)	:	2672
Proper Shipping Name (IATA)	:	Ammonia solutions
Class (IATA)	:	8 - Corrosives
Packing group (IATA)	:	III - Minor Danger

SECTION 15: Regulatory information

15.1. US Federal regulations

Ammonium Hydroxide, ACS (1336-21-6)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Subject to reporting requirements of United States SARA Section 313	
RQ (Reportable quantity, section 304 of EPA's List of Lists)	1000 lb
SARA Section 311/312 Hazard Classes	Health hazard - Acute toxicity (any route of exposure) Health hazard - Skin corrosion or Irritation Health hazard - Serious eye damage or eye irritation

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

Chemical(s) subject to the reporting requirements of Section 313 or Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and 40 CFR Part 372.

Ammonia	CAS-No. 7664-41-7	28%

Ammonia (7664-41-7)	
RQ (Reportable quantity, section 304 of EPA's List of Lists)	1000 lb
SARA Section 302 Threshold Planning Quantity (TPQ)	500 lb

15.2. International regulations

CANADA

No additional information available

Ammonia (7664-41-7)
Listed on the Canadian DSL (Domestic Substances List)

EU-Regulations
No additional information available

National regulations

Ammonia (7664-41-7)
Listed on the Canadian IDL (Ingredient Disclosure List)

15.3. US State regulations
California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm

SECTION 16: Other information

Revision date : 11/21/2016

Training advice : Users of breathing apparatus must be trained.

Other information : None.

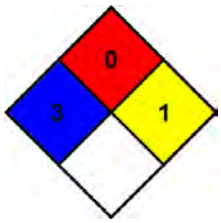
Full text of H-phrases: see section 16:

H221	Flammable gas
H280	Contains gas under pressure; may explode if heated
H302	Harmful if swallowed
H314	Causes severe skin burns and eye damage
H318	Causes serious eye damage
H331	Toxic if inhaled
H332	Harmful if inhaled
H400	Very toxic to aquatic life

NFPA health hazard : 3 - Materials that, under emergency conditions, can cause serious or permanent injury.

NFPA fire hazard : 0 - Materials that will not burn under typical dire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand.

NFPA reactivity : 1 - Materials that in themselves are normally stable but can become unstable at elevated temperatures and pressures.



Hazard Rating

Health : 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given

Flammability : 0 Minimal Hazard - Materials that will not burn

Physical : 1 Slight Hazard - Materials that are normally stable but can become unstable (self-react) at high temperatures and pressures. Materials may react non-violently with water or undergo hazardous polymerization in the absence of inhibitors.

Personal protection : H

H - Splash goggles, Gloves, Synthetic apron, Vapor respirator

SDS US LabChem

Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.

APPENDIX D

HAZARDOUS MATERIALS INVENTORY

INVENTORY OF CHEMICALS AT PRAIRIE CREEK MINE

CHEMICAL	FORMULA	COMMENT	PALLETS	BAGS/DRUMS	Kg/L
Reagent Pad					
Copper Sulphate	$CuSO_4$	Plastic bags in seacrates	194	7,760	194,000
Sodium Isopropyl Xanthate	(CH3)2CHCH2-O-(C=S)S.Na	Six K steel drums	57	228	22,800
		Cyanamid steel drums	23	92	9,200
Methyl Isobutyl Carbinol (MIBC) solvent	$C_6H_{14}O$	205L drums	4	16	3,280
Dowfroth glycol	$HOCH_2CH_2OH$	205L drums	4	14	2,870
Methanol solvent	CH_3OH	205L drums	3	11	2,255
Dowtherm glycol	$HOCH_2CH_2OH$	205L drums	28	98	20,090
Xanthate Debris - Gravel/Dirt/Plastic		1000 kg bulk bag		16	12,000
Contaminated Soil-Hydrocarbon		205L drums		9	1,350
Mill					
Soda Ash	Na_2CO_3	Bags	60	1,800	72,000
Used oil		205L drums		11	2,255
Unfiltered diesel		205L drums		31	6,355
SP Lube 120		205L drums		12	2,460
Lubecore 3		205L drums		26	5,330
EP 460 lube		205L drums		1	205
AW 66		205L drums		1	205
Varsol Solvent		205L drums		1	205
Univis 32		205L drums		3	615
Main Yard					
Soda Ash (Sodium Carbonate)	Na_2CO_3	Bags		1,359	54,360
Lime (Calcium Hydroxide)	CaO	Bags		5,990	125,790

INVENTORY OF CHEMICALS AT PRAIRIE CREEK MINE

CHEMICAL	FORMULA	COMMENT	PALLETS	BAGS/DRUMS	Kg/L
Drill Supply Trailer					
Big Bear Rod Grease		20L plastic pail		24	480
Linseed Soap		20L plastic pail		48	960
Drilling Polymer		20L plastic pail		33	660
Linseed Lube		20L plastic pail		19	380
Dr133 Polymer		20L plastic pail		5	100
Lubtub		20L plastic pail		3	60
Number One Mud		20L plastic pail		2	40
G-Stop Coarse		20L plastic pail		15	300
Quickset		20L plastic pail		19	380
Drill Grease		20L plastic pail		2	40
W-OB Polymer		20L plastic pail		4	80
Clay Stabilizer		20L plastic pail		16	320
Old Kitchen					
Headlamp Batteries		Each		60	
CDC Dishwasher Compound		Bag		1	40
Acid Shack					
Hydrochloric Acid					540
Battery acid					20
Ammonium Chloride					12
Potassium Iodide					7
Hydrofluoric Acid					16
Phosphoric Acid					12
Sanfax FastGlo					10
Sodium Hydroxide					28
Ammonium Hydroxide					360
ONOX Solution					12
Floor Wax					12
CV 100 fuel additive					56
Waterproofing paint					112

INVENTORY OF CHEMICALS AT PRAIRIE CREEK MINE

CHEMICAL	FORMULA	COMMENT	PALLETS	BAGS/DRUMS	Kg/L
Cold Storage					
3 x 20lt Contaminated Soil- Hydrocarbon		20L plastic pail		3	60
1 x 20lt Used Oil/Grease		20L plastic pail		1	20
2 x 1000kg Repacked Copper Sulphate		1000 kg bulk bag		2	2,000
1/4 Repack Bag Contaminated Soil- Copper Sulphate		1000 kg bulk bag		1/4	250
Tank Farm Trailer					
Lubecoat Grease		20L metal pail		200	4,000
Batteries-various sizes/types				200-250	
Paint		20L metal pail		75	1,500
Paint		4L metal pail		20	80
Machine Shop Containment					
30W engine Oil		205L steel drum		23	4,715
75W90 Gear Oil		205L steel drum		12	2,460
Univis 32		205L steel drum		4	820
10W engine Oil		25,623L tank		3/4	19,217
Lube Oil Containment					
10W engine oil		205L steel drum		1	205
30W engine oil		205L steel drum		122	25,010
40W engine oil		205L steel drum		28	5,740
Harmony oil lubricant		205L steel drum		25	5,125
SP oil lubricant 150		205L steel drum		4	820
Ardee 150 oil lubricant		205L steel drum		14	2,870
Solvent		205L steel drum		1	205
Grease		205L steel drum		5	1,025
Water Treatment Shack					
Sodium Sulphide		25 kg bags		10	250
Ferric Sulphate		20L pails		8	160