# Appendix B
# KUGLUKTUK WATER SUPPLY IMPROVEMENTS

## SPILL CONTINGENCY PLAN
## GOVERNMENT OF NUNAVUT

# NUNAVUT

*July 2008*

# Table of Contents

Page #



# List of Appendices

## 1.0 Introduction

This Spill Contingency Plan shall be in effect from July 01, 2008. Any proposed changes and/or amendments will be submitted to the Nunavut Water Board.

This Spill Contingency Plan has been specifically prepared for the Kugluktuk Water Supply Improvements Exploration Program. This Plan shall be posted at the drill shack and a copy will be kept in the office.

## 2.0 Petroleum and Chemical Product Storage and Inventory

### 2.1 Storage

Fuel will be stored in accordance with the DRAFT INAC Fuel Storage and Handling Guidelines, see Appendix III. Fuel drums will be stored on their sides with bungs facing 3:00 and 9:00 to minimize the volume of a potential spill. Drums will be stored in neat rows with adequate spacing between each row to allow for inspections. The fuel cache will be inspected daily.

### 2.2 Petroleum Product Transfer

Manual and automatic pumps are used for the transfer of all petroleum products. Smoking, sparks, or open flames are **prohibited** in fuel storage and fuelling areas at all times.

In areas of refuelling, a spill kit will always be stored. Secondary containment will be used in areas of refuelling and drums will be stored within this secondary containment.

## 3.0 Risk Assessment and Mitigation of Risk

### 3.1 Petroleum Products and Other Fuels

Following, is a list of sources:

1) Drummed product: Leaks or ruptures may occur. This includes drums of Diesel, Gasoline, Waste Fuel, and Waste Oil.

2) Fuel cylinders: Propane, leaks may occur at the valves. All cylinders are secured at all times.

3) Vehicles and equipment: Wheeled vehicles and equipment, aircraft (fixed and rotary wing), snowmobiles, generators, pumps. Incidents involving leaking or dripping fuels and oils may occur due to malfunctions, impact damage, and lack of regular maintenance, improper storage, or faulty operation.

Regular inspection and maintenance in accordance with recognized and accepted standard practices reduces risks associated with the categories listed above.

Spill Kits will be located at fuel caches and drill shacks. A description of contents is listed in Section 6.0.

## 4.0 Responding to Failures and Spills

### 4.1 Spill Response Contact List

24 Hour Spill Line
(867) 920-8130

INAC Water Resource Officer
Iqaluit, Nunavut
(867) 975-4295

INAC Water Resource Officer
Kugluktuk, Nunavut
(867) 982-4302

Environment Canada
Iqaluit, Nunavut
(867) 975-4644
24 hour pager – (867) 766-3737

Government of Nunavut

### 4.2 Basic Steps — Spill Procedure

In the case of any spill or other environmental emergency, it is necessary to react in the most immediate, safe, and environmentally responsible manner. No spill or incident is so minor that it can be ignored and every spill must be reported.

The basic steps of the response plan are as follows:

1. *Ensure* the safety of all persons at all times.

2. *Identify* and find the spill substance and its source, and, if possible, stop the process or shut off the source.

3. *Inform* the on-site coordinator or his/her designate at once, so that he/she may take the appropriate actions. Appropriate action includes the notification of the spill to the 24 hour Spill Line and INAC Water Resource Officers, a copy of the Spill Report form can be found in Appendix I.

4. *Contain* the spill or environmental hazard, as per its nature, and as per the advice of the Spill Line and the INAC Water Resource Officer as required.

5. *Implement* any necessary cleanup and/or remedial action.

### 4.3 Basic Steps — Chain of Command

1. *Immediately* notify and report to the 24-Hour Spill Line at (867) 920-8130, the INAC Water

Resources Officers in Nunavut at (867) 975-4298 and (867) 982-4302, and Environment Canada personnel at 867-975-4644.

2. ***A Spill Report Form (Appendix I)*** is filled out as completely as possible before or after contacting the 24 Hour Spill Line. A copy of the guidelines for completing the spill report form can be found in Appendix II.

3. Notify Sudhir Kumar Jha, Government of Nunavut, (867) 983-4008

### 4.4 Other contacts for spill response/assistance and further reporting

| | |
|---|---|
| Nunavut Water Board | (867) 360-6338 |
| Fisheries and Oceans Canada Habitat Impact Assessment Biologist | (867) 979-8007 |
| Government of Nunavut Department of Environment | (867) 975-5910 |

## 5.0 Taking Action

### 5.1 Before the Fact: Preventative Measures

The following actions illustrate a proactive approach to environmental stewardship. In addition, these actions minimize the potential for spills during fuel handling, transfer and storage:

1. Fuel transfer hoses with cam lock mechanisms are used.

2. Carefully monitor fuel content in the receiving vessel during transfer. Always have additional absorbent pads on hand while transferring fuel.

3. Clean up drips and minor spills immediately.

4. Regularly inspect drums, tanks and hoses for leaks or potential to leak and for proper storage.

5. Create fuel caches in natural depressions that are located a **minimum** of 31 metres from the normal high-water mark of any water body.

6. Train personnel, especially those who will be operators, in proper fuel handling and spill response procedures.

### 5.2 After the Fact: Mitigative Measures

1. First steps to take when a spill occurs:
    a) Ensure your own safety and that of others around you, beginning with those nearest to the scene.
    b) Control danger to human life, if necessary.
    c) Identify the source of the spill.

d) Notify your supervisor, request assistance if needed.
e) Assess whether or not the spill can be readily stopped.
f) Contain or stop the spill at the source.

2. Secondary steps to take:
   a) Determine status of the spill event.
   b) If necessary, pump fuel from a damaged and/or leaking tank or drum into a refuge container.
   c) Notify the 24-hour Spill Report Line, and receive further instructions from the appropriate contact agencies listed in *Section 4.3*. (disposal of contaminated soil or ice/snow in sealed containers for removal from site, etc.).
   d) Complete and Fax a copy of the Spill Report Form *(Appendix I)*.
   e) Notify permitting authorities.
   f) If possible, resume cleanup and containment.

**Emergency Contact Information**

| CONTACT | TELEPHONE NUMBER |
|---|---|
| Andrew Keim - INAC Water Resource Officer, Iqaluit | (867) 975-4295 |
| Melissa Joy - INAC Water Resource Officer, Kugluktuk | (867) 982-4302 |
| Environment Canada | (867) 975-4644, 24hr page (867) 766-3737 |
| Nunavut Department of Environment | (867) 975-5910 |
| DFO | (867) 979-8007 |
| Air Tindi | (867) 669-8212 |
| Yellowknife Fire Department | (867) 873-2222 |
| Stanton Regional Hospital – Yellowknife | (867) 920-4111 |
| Sudhir Kumar Jha – Project Officer, GN | (867) 983-4008 |

## 5.3 SPILL RESPONSE ACTIONS
## DIESEL FUEL, HYDRAULIC OIL, AND LUBRICATING OIL

Take action only if safety permits – stop the source flow if safe to do so and eliminate all ignition sources. **Never smoke** when dealing with these types of spills.

**On Land**
Build a containment berm using soil material or snow and place a plastic tarp at the foot of the berm for easy capture of the spill after all vapours have dissipated.
Remove the spill by using absorbent pads or excavating the soil, gravel or snow.
Remove spill splashed on vegetation using particulate absorbent material.
Contact regulatory agencies for approval before commencing with the removal of any soil, gravel, or vegetation.

**On Muskeg**
Do not deploy personnel and equipment on marsh or vegetation.
Remove pooled oil with sorbent pads and/or skimmer.
Flush with low pressure water to herd oil to collection point.
Burn only in localized areas, e.g., trenches, piles or windrows.
Do not burn if root systems can be damaged (low water table).
Minimize damage caused by equipment and excavation.

**On Water**
Contain spill as close to release point as possible.
Use containment boom to capture spill for recovery after vapours have dissipated.
Use absorbent pads to capture small spills.
Use skimmer for larger spills.

**On Ice and Snow**
Build a containment berm around spill using snow.
Remove spill using absorbent pads or particulate sorbent material.
The contaminated ice and snow must be scraped and shovelled into plastic buckets with lids, 205 litre drums, and/or polypropylene bags.

**Storage and Transfer**
All contaminated water, ice, snow, soil, and clean up supplies will be stored in closed, labelled containers. All containers will be stored in a well ventilated area away from incompatible materials.

**Disposal**
Any contaminated material will be shipped from site to an appropriate and approved facility. The DOE monitors the movement of hazardous wastes from generators, carriers to receivers, through a tracking document (Waste Manifest). A Waste Manifest will accompany all movements.

## 5.3 SPILL RESPONSE ACTIONS
## GASOLINE AND JET B AVIATION FUEL

Take action only if safety permits – stop the source flow if safe to do so and eliminate all ignition sources. **Never smoke** when dealing with these types of spills.

**On Land**
Build a containment berm using soil material or snow and place a plastic tarp at the foot of the berm for easy capture of the spill after all vapours have dissipated.
Remove the spill by using absorbent pads or excavating the soil, gravel or snow.
Remove spill splashed on vegetation using particulate absorbent material.
Contact regulatory agencies for approval before commencing with the removal of any soil, gravel, or vegetation.

**On Muskeg**
Do not deploy personnel and equipment on marsh or vegetation.
Remove pooled gasoline or Jet B with sorbent pads and/or skimmer.
Flush with low pressure water to herd oil to collection point.
On advice from regulatory agencies, burn only in localized areas, e.g., trenches, piles or windrows.
Do not burn if root systems can be damaged (low water table).
Minimize damage caused by equipment and excavation.

**On Water**
Contain spill as close to release point as possible.
Use containment boom to capture spill for recovery after vapours have dissipated.
Use absorbent pads to capture small spills.
Use skimmer for larger spills.

**On Ice and Snow**
Build a containment berm around spill using snow.
Remove spill using absorbent pads or particulate sorbent material.
The contaminated ice and snow must be scraped and shovelled into plastic buckets with lids, 205 litre drums, and/or polypropylene bags.

**Storage and Transfer**
All contaminated water, ice, snow, soil, and clean up supplies will be stored in closed, labelled containers. All containers will be stored in a well ventilated area away from incompatible materials.

**Disposal**
Any contaminated material will be shipped from site to an appropriate and approved facility. The DOE monitors the movement of hazardous wastes from generators, carriers to receivers, through a tracking document (Waste Manifest). A Waste Manifest will accompany all movements.

## 5.3 SPILL RESPONSE ACTIONS
## PROPANE

Take action only if safety permits. Gases stored in cylinders can explode when ignited. Keep vehicles away from area. **Never smoke** when dealing with these types of spills.

**On Land**
Do not attempt to contain the propane release.

**On Water**
Do not attempt to contain the propane release.

**On Ice and Snow**
Do not attempt to contain the propane release.

**General**
It is not possible to contain vapours when released.
Water spray can be used to knock down vapours if there is no chance of ignition.
Small fires can be extinguished with dry chemical of $CO_2$.
Personnel should withdraw immediately from area unless a small leak is stopped immediately after it has been detected.
If tanks are damaged, gas should be allowed to disperse and no recovery attempt should be made.
Personnel should avoid touching release point on containers since frost forms very rapidly.
Keep away from tank ends.

**Storage and Transfer**
It is not possible to contain vapours when released.

**Disposal**
Any contaminated material will be shipped from site to an appropriate and approved facility. The DOE monitors the movement of hazardous wastes from generators, carriers to receivers, through a tracking document (Waste Manifest). A Waste Manifest will accompany all movements.

## 6.0 Spill Equipment

Complete spill kits are kept on hand at all camps and drill shacks. Spill kits contain:

1 – 360 litre/79 gallon polyethylene over-pack drum
4 – oil sorbent booms (5" X 10')
100 – oil sorbent sheets (16.5" X 20" X 3/8")
1 – drain cover (36" X 36" X 1/16")
1 – Caution tape (3" X 500')
1 – 1 lb plugging compound
2 – pair Nitrile gloves
2 – pair Safety goggles
2 – pair Tyvek coveralls
1 – instruction booklet
10 – printed disposable bags (24" X 48")
1 – shovel

In addition at least one empty fuel drum will be located at each fuel cache in the event of damaged or leaking drums. Extra absorbent pads will be kept with the helicopter, drill and any area where re-fuelling, transferring and/or handling is done.

# Appendix I
# Nunavut Spill Report Form

# NUNAVUT SPILL REPORT (Oil, Gas, Hazardous Chemicals or other Materials)

**NUNAVUT KUVIHIMAYMIK UNIUT** (Ukhukyuak, Gasiliik, Hivuganaktun Aavughat Aalaatluniit)


**24-Hour Report Line Uumiyuituk Unikhiut Hivayaut**
**Phone/Hivayaut (867) 920-8130**
**Fax/Kayumiktuk (867) 873-6924**


| **A** Report Date and Time Uniutim Ublua Ublukhiutalu | **B** Date and Time of Spill(if known) Ublua Ublukhiutalu Kuvinium(ilihimayaukpan) | **C** Original Report Hivulikpak Uniut<br>Update No. _____<br>Ilihimapkangnik Napa. | Spill Number Kuvinium Napa |
|---|---|---|---|
| | | | |

**D** Location and Map Coordinates (if known) and Direction (if moving) Humiituk Nunauyamilu Pakitjutaa (ilihimayaukpan) Humungaulikalu (kugluakan)

**E** Party Responsible for Spill ( Full Name and Address) Kitkuut Kuvipkaiyun (Tamaita Atiin Nunakakviangalu)

**F** Product(s) Spilled and Estimated Quantities(provide metric volumes/weights if possible) Hunat Kuviyun Angiklilangiitlu(tunilugin kafi kaalanlu/ukumaitilangalu ilihimagungi)

**G** Cause of Spill Huuk kiviyuk

| **H** Is Spill Terminated? Kuvihuikaa?<br>Yes/Hii No/Imaanak | **I** If Spill is Continuing, give Estimated Rate Kuvigaanginakan kayumilanguta ukaguk | **J** Is Further Spillage Possible? Kuvifakniagungnaghivaa?<br>Yes/Hii No/Imaanak | **K** Extent of Contaminated Area(in square metres if possible) Angiklilanga halumaighimanuim(uuktuut kikagituk miitusni ilihimagungni) |
|---|---|---|---|
| | | | |

| **L** Factors Affecting Spill or Recovery(weather conditions, terrain, snow cover, etc.) Huunat Havaluatilimaijutin Kuvinikmun Halumaghinikmunlu(hilakluknik, nunap kaanga, apuutpalaknik, atlatlu) | **M** Containment(natural depression, dykes, etc.) Katitikvia (iitighak, maghakviit,alatlu) |
|---|---|
| | |

**N** Action, if any, taken or Proposed to Contain, Recover, Clean up or Dispose of Product(s) and Contaminated Materials Hulivin, huliguvin, Kanuklu Kaatitiniaka, Pifaklugu, Halumaktiklugu Igitlugiitluniit Kuvihimayut

| **O** Do You Require Assistance? Ikayuktauyumaviin? No/Imaanak Yes/Hii, describe: Kaanuk: | **P** Possible Hazards to Persons, Property or Environment e.g. fire, drinking water, fish or wildlife. Hivuganakniagungnaghivun Inuknun, Tamayanun Avatimunluniit e.g. ikualak, iimiktakvik, ikaluit hugajutinluniit. |
|---|---|
| | |

**Q** Comments and/or Recommendations Ukagiyain uvvalu/unaluniit Pitkuugaluaktain

.....

.....

.....

.....

.....

.....

.....

.....

**FOR SPILL LINE USE ONLY KUVINIUM HIVAYAUTAGINATA ATUKTAGHA**

Lead Agency Hivulik Havakvik

.....

Spill Significance Kivunium Angingninga

.....

Lead Agency Contact and Time Hivulium Havakviim Ukakatigiluagha Humungakanlu

.....

.....

.....

Is this file now closed? Una tutkumavia umikpaa?

.....

| Reported By Unikhiukti | Position, Employer, Location Haavanga, Havakvia, Humi | Telephone Hivayaut |
|---|---|---|
| | | |

| Reported To Unikhiuktuk Kinamun | Position, Employer, Location Haavanga, Havakvia, Humi | Telephone Hivayaut |
|---|---|---|
| | | |

# Appendix II
# Instructions for Completing the NU Spill Report Form

# Instructions for Completing the NT-NU Spill Report Form

**This form can be filled out electronically and e-mailed as an attachment to spills@gov.nt.ca. Until further notice, please verify receipt of e-mail transmissions with a follow-up telephone call to the spill line. Forms can also be printed and faxed to the spill line at 867-873-6924. Spills can still be phoned in by calling collect at 867-920-8130.**

| | |
|---|---|
| **A. Report Date/Time** | The actual date and time that the spill was reported to the spill line. If the spill is phoned in, the Spill Line will fill this out. **Please do not fill in the Report Number**: the spill line will assign a number after the spill is reported. |
| **B. Occurrence Date/Time** | Indicate, to the best of your knowledge, the exact date and time that the spill occurred. Not to be confused with the report date and time (see above). |
| **C. Land Use Permit Number /Water Licence Number** | This only needs to be filled in if the activity has been licenced by the Nunavut Water Board and/or if a Land Use Permit has been issued. Applies primarily to mines and mineral exploration sites. |
| **D. Geographic Place Name** | In most cases, this will be the name of the city or town in which the spill occurred. For remote locations – outside of human habitations – identify the most prominent geographic feature, such as a lake or mountain and/or the distance and direction from the nearest population center. **You must include the geographic coordinates** (Refer to Section E). |
| **E. Geographic Coordinates** | This only needs to be filled out if the spill occurred outside of an established community such as a mine site. Please note that the location should be stated in degrees, minutes and seconds of Latitude and Longitude. |
| **F. Responsible Party Or Vessel Name** | This is the person who was in management/control/ownership of the substance at the time that it was spilled. In the case of a spill from a ship/vessel, include the name of the ship/vessel. Please include full address, telephone number and e-mail. Use box K if there is insufficient space. **Please note that, the owner of the spilled substance is ultimately responsible for any spills of that substance, regardless of who may have actually caused the spill.** |
| **G. Contractor involved?** | Were there any other parties/contractors involved? An example would be a construction company who is undertaking work on behalf of the owner of the spilled substance and who may have contributed to, or directly caused the spill and/or is responding to the spill. |
| **H. Product Spilled** | Identify the product spilled; most commonly, it is gasoline, diesel fuel or sewage. For other substances, avoid trade names. Wherever possible, use the chemical name of the substance and further, identify the product using the four digit UN number (eg: UN1203 for gasoline; UN1202 for diesel fuel; UN1863 for Jet A & B) |
| **I. Spill Source** | Identify the source of the spill: truck, ship, home heating fuel tank and, if known, the cause (eg: fuel tank overfill, leaking tank; ship ran aground; traffic accident, vandalism, storm, etc.). Provide an estimate of the extent of the contaminated/impacted area (eg: 10 $m^2$) |
| **J. Factors Affecting Spill** | Any factors which might make it difficult to clean up the spill: rough terrain, bad weather, remote location, lack of equipment. Do you require advice and/or assistance with the cleanup operation? Identify any hazards to persons, property or equipment: for example, a gasoline spill beside a daycare centre would pose a safety hazard to children. Use box K if there is insufficient space. |
| **K. Additional Information** | Provide any additional, pertinent details about the spill, such as any peculiar/unique hazards associated with the spilled material. State what action is being taken towards cleaning up the spill; disposal of spilled material; notification of affected parties. If necessary, append additional sheets to the spill report. Number the pages in the same format found in the lower right hand corner of the spill form: eg. “Page 1 of 2", “Page 2 of 2" etc. **Please number the pages to ensure that recipients can be certain that they received all pertinent documents.** If only the spill report form was filled out, number the form as “Page 1 of 1". |
| **L. Reported to Spill Line by** | Include your full name, employer, contact number and the location from which you are reporting the spill. Use box K if there is insufficient space. |
| **M. Alternate Contact** | Identify any alternate contacts. This information assists regulatory agencies to obtain additional information if they cannot reach the individual who reported the spill. |
| **N. Report Line Use Only** | **Leave Blank**. This box is for the **Spill Line’s use only**. |

# Appendix III
# DRAFT INAC FUEL STORAGE AND HANDLING GUIDELINES

Indian and Northern Affairs Canada | Affaires indiennes et du Nord Canada

Indian and Northern Affairs Canada
Box 100
Iqaluit, Nunavut
X0A 0H0

April 2008

*Your file Votre référence*

*Our file Notre référence*

**Re: Indian and Northern Affairs Canada, Nunavut Region, Draft Fuel Storage and Handling Guidelines**

Over the last year Indian and Northern Affairs Canada have heard of concerns from the resource exploration industry and others that it is sometimes unclear what the requirements for fuel storage and handling in Nunavut are. There have also been differences of opinion between private land owners, regulators and industry on what the requirements should be for this activity.

Over the last several months the Nunavut Regional Office of INAC has had extensive discussion and debate on this issue, researched the practice in Nunavut and other jurisdictions and have developed the attached draft guidelines and are now requesting interested parties to review and provide feedback and comments on the guidelines.

Please note that these guidelines, once finalized, are a reference tool to guide this type of activity. It should be understood that land users will always be required to comply with the terms and conditions of regulatory instruments and legislation that apply.

We request that you provide your comments and feedback to Diane Charles, Risk Management Analyst by the 30th of April 2008. You can forward your comments to Diane as follows;
Email: CharlesDM@inac-ainc.gc.ca
Telephone: 867-975-4657
Fax: 867-975-4286

We look forward to receiving your feedback on these draft guidelines.

Sincerely,

Carl McLean
Director, Operations

Attachment: Draft Fuel Storage and Handling Guidelines

# Indian and Northern Affairs Canada - Nunavut
## Draft Fuel Storage and Handling Guidelines
## April 2008

## Introduction and Background

Fuel handling and storage in land use applications must be conducted properly to prevent environmental damage and protect public and worker safety. This requires an understanding of the basic standards. Although the rules that govern fuel storage and handling in Nunavut are numerous and complex, the intent and safeguards created by the laws are similar for most types of land uses on crown land.

These guidelines are a reference tool only and not a legal document. They are designed to assist land users in their required compliance with the rules and regulations relating to fuel storage and handling. This guide does not purport to address all requirements, rules and regulations governing the use of fuel, its transportation and storage, rather, it provides guidelines for responsible environmental practice in dealing with fuel storage and handling. The ultimate responsibility for compliance with legal requirements remains with the land user. For any specific fact situation or particular land use site it is recommended that the operator refer to all relevant regulatory agencies. Land users are encouraged to contact government departments and agencies for copies of current legislation and regulations and are reminded that applicable laws are amended from time to time.
Relevant Acts and regulations can be accessed on the Justice Canada website at http://laws.justice.gc.ca or on the Indian and Northern Affairs Canada website at http://www.ainc-inac.gc.ca/nu/nuv/index_e.html

Terms and conditions in regulatory instruments are also based on the environmental assessment conducted by the Nunavut Impact Review Board (NIRB). NIRB can recommend specific requirements for most aspects of land use activity, including terms and conditions related to fuel storage and handling.

Land and water use in Nunavut are regulated by various legislation and policies. Primarily, a water license and a land use permit or a land lease are required to conduct activity on crown land and use water or deposit waste. These permits / leases / licenses may include specific provisions for fuel handling and storage. For all water use, the Nunavut Water Board issues water licences often with conditions related to fuel handling, storage of fuel and handling of waste petroleum products and chemicals.

## Containment, Storage and Handling of Petroleum Products and Chemicals

There is a wide range of legislation that may apply to fuel handling and storage. The following is a list of good environmental practices that should be used to guide land use activities. Storage and handling practices are presented for the most common petroleum products used for land use activities: diesel fuel, gasoline, aviation fuel, lubricating oil, solvents, and grease.

The term "chemicals" obviously covers a very broad range of substances, which can mean anything from household bleach to sodium cyanide. The Transportation of Dangerous Goods Act and Regulations (TDG) lists over 2,000 chemical formulations used in Canada today as commercially available, controlled products. Only a selected list of chemicals that may be used in most remote land use activities are used here.

Some basic guidelines that are relevant to fuel and chemical storage and handling:

- Fuel and other petroleum products and chemicals shall be stored and transferred in such a manner as to prevent spillage into a body of water or onto the surrounding land.
- A fuel spill emergency plan must be in place and a copy of it posted on-site and easily accessible in the event of a spill.
- When the total quantity of fuel in a single storage tank exceeds 4,000 litres, a secondary containment facility must be constructed. At a minimum, the secondary containment shall be of sufficient size to accommodate at least 110 percent of the fuel storage tank capacity. In addition, it must be lined with a material impervious to petroleum products. If there is more than one storage tank exceeding 4,000 litres in capacity, the secondary containment facility must be of sufficient size to accommodate 110 percent of the capacity of the largest tank or 10 percent of the total capacity of all the tanks, whichever size is greater. The definition of storage tanks are tanks greater than 230 litres.
- Vehicles must be maintained and operated in a manner designed to prevent spills of fuel or oil.
- At the present time fuel bladders do not have the necessary industry certification that ensures they meet requirements for use in the Nunavut environment. At this time, INAC will not accept fuel bladders as an acceptable method of fuel storage nor does it consider bladders as an acceptable ground transport method.
- If fuel bladders are in existence prior to January 1, 2008 INAC inspectors will use their discretion and authority to confirm the acceptability of the installation and operation of these existing fuel bladders. These existing bladders will need to be replaced by an acceptable storage tank. The time frame is to be negotiated with INAC's Field Operations Inspector.
- Secondary containment is strongly recommended for all fuel storage.

## *Fuel stored in 205L Drums*

Caches of drummed fuel can be particularly subject to spillage as they are susceptible to damage from equipment, become buried in snow, etc.. Fuel stored in drums must follow these guidelines:

- To prevent spreading in the event of a spill, whenever practical, the drums should be located in a natural depression a minimum distance of 31m from all water bodies.
- Fuel drum storage locations must be surrounded by impact barriers and clearly identified with safety markers which are high enough to be visible during snow cover. This is to protect the fuel storage from being impacted and damaged by the mobile equipment.

- Store fuel drums in an upright position to prevent the possibility of spills and leaks; or store fuel drums in a horizontal position with the bungs at 3 and 9 o-clock.
- All fuel barrels must be labelled with the owners name and the year delivered to site.
- It is not recommended to reuse (refill) barrels as the seals are not as secure.
- Fuel drums must be organized and stored in a safe and sound manner. eg. The base should not be lumpy or rocky (reasonably flat). The height and method of stacked drums should be safe to ensure they are stable.
- Large fuel caches in excess of 20 drums should be inspected daily. For long term storage >6 months it is strongly recommended that drummed fuel be stored on pallets to prevent rusting.
- All fuel barrels must be labelled with the owners name and date of delivery to site. It is not recommended that fuel barrels remain longer than two years at remote sites.

In addition to the above conditions which relate to fuel and chemical storage and handling, one must also comply with all of the appropriate terms and conditions of regulatory instruments and any applicable legislation.

## FUEL PRODUCTS

This section applies to commonly used products in land use activities such as diesel fuel, gasoline, and aviation fuel.

### *Fuel Storage*

The following are some general guidelines concerning all types of fuel storage:

- Ensure that all fuel containers, regardless of size, are situated on stable ground located at least 31 meters horizontal distance away from the high water mark of any watercourse or waterbody; If fuel storage area includes secondary containment, the perimeter of the secondary containment must also respect the 31 meters condition.
- Spill kits of appropriate size/capacity must be made readily accessible near all fuel storage and fuel transfer areas
- Fuel transfers or refueling operations must be done in an area that is equipped with drip pans and / or secondary containment, a spill kit and a copy of the spill clean up and contingency plan. All transfer and refueling operations must be done by trained staff.
- All waste petroleum products must be safely stored on-site and comply with the guidelines for regular fuel storage and handling. Inspection and monitoring logs must be kept – include when waste was put in storage, what the product is, quantity, date of inspection, by whom. These logs could be kept with other camp logs.
- All fuel spills must be immediately contained, cleaned up and reported to the spill line –

complete report must be filed with the inspector within 30 days.

- Fuel storage locations must be surrounded by impact barriers and clearly identified with safety markers which are high enough to be visible during snow cover. This is to protect the fuel storage from being impacted and damaged by the mobile equipment.

## Secondary Containment

**Secondary Containment** means a container that prevents leaks or spills from reaching outside the containment area.

Secondary containment is a preventative measure designed to minimize environmental damage resulting from a failure of the primary tank storage system itself. This is a required back up system that prevents leaks or spills from the storage tank(s) from escaping the containment area and contaminating soil, surface water or groundwater. It can be a double-walled or contained aboveground tank, a leak-proof barrier such as a lined berm, a commercially custom-built system, or a field-constructed system that meets the intent of the legislation and guidelines. The following is an overview of the most common types: contained tanks, double-walled tanks, and dyked containment systems.

### *Contained Tanks And Double-Walled Tanks*

The petroleum industry has responded to the regulatory requirement for secondary storage by developing tanks that have built-in secondary containment consisting of either a steel tank enclosed in a steel box (contained tank), or a tank within a tank (double-walled tank). These kinds of systems meet the intent of secondary containment. General requirements follow:

- The tank must meet all federal and territorial regulations and guidelines that apply.
- If the tank is used in a fuel transfer area, it must have some kind of secondary containment to capture spills from the tank, piping, and fuel pump as well;
- For double-walled tanks, the space between the two tanks must be monitored for vacuum, have a port to allow monitoring of hydrocarbon vapours by use of a sensor, and an emergency vent;
- For contained tanks, the space between the two tanks should be accessible for manual inspection and leak detection or monitoring;
- The tank must be checked daily and records kept of the daily inspections;
- The tank must be provided with an overfill device, manhole, emergency vent, containment pump out, ball float vent valve, ladder and platform, cam-lock fill connection and cap, and fill spill containment sump. Normally, the tank will be supplied with these features from the supplier.

### *Dyked Containment*

A variety of materials may be acceptable for use in a dyked containment system, including

impermeable materials such as steel, concrete, clay and geomembranes. The use of clay materials is generally discouraged because it is difficult to ensure the long-term integrity of the liner, which may be subject to soil cracking and leakage. Also, if a fuel leak were to occur, the clay liner materials would become contaminated, thus creating an additional disposal problem. If clay, steel or concrete materials are proposed for use in a containment system, Institutions of Public Government or other responsible authorities may require designs that have been approved and sealed by a qualified professional engineer registered in the Nunavut. Geomembrane is generally the most cost-effective material to use, and is discussed in the following guidelines for the construction and operation of dyked containment aboveground tanks with capacity of 4000L or greater.

- Grade the storage site so that accidental leaks or spills are diverted from entering any surface or groundwater;

- Calculate the containment volume so that it contains "at least 110 percent of the fuel in the case of a single storage tank. If there is more than one storage tank, the secondary containment facility must be of sufficient size to accommodate 110 percent of the capacity of the largest tank or 10 percent of the total capacity of all the tanks, whichever is greater";

- Horizontal tanks inside the containment area must be supported OFF THE GROUND on skids or on a cradle. The support system should not be of flammable materials and should preferably be steel, concrete or masonry construction;

- Use appropriate liner material that is rated and suited for the task. For long-term secondary containment systems, use geomembrane material that is at least 0.76 millimetres (30 mil) thick and preferably non-reinforced to allow for deformation while still maintaining its integrity. When possible, it is recommended that the liner be pre-formed and pre-seamed to its full size at the factory, such that it can be set in place in the field. This eliminates the need for field seaming;

- The liner must be covered with a non-combustible material of such nature and thickness that it will ensure the continued integrity of the liner The liner should be covered with at least 150 millimetres of clean sand underneath the tank. This sand cover will help to distribute the weight of the tanks and will protect the liner from damage. Most liners will deteriorate over time due to UV radiation and, as such, the sand cover will extend the life of the system;

- For short-term, secondary containment needs such as at fly-in camps, an oil-resistant and ultraviolet light-resistant, reinforced geomembrane liner might be better suited, especially if it is intended to be salvaged and removed at the end of a season and re-used. In such cases, a protective sand cover may not be warranted except as bedding beneath tank supports; Common construction grade "vapour barrier" and woven polyethylene tarpaulins are not suitable for secondary containment of fuel.

- The preferred subgrade for construction of the containment area is fine-grained granular soils such as sands or gravels. If gravels or cobbles are encountered, then a 150 millimetres layer;

- Berms should have 3:1 (horizontal:vertical) side slopes on both the inside and outside slopes. Berm top width should be at least 1.2 metres , depending on size and height of berm;

- The liner should be keyed into the top of the berm as indicated in Figure 1;

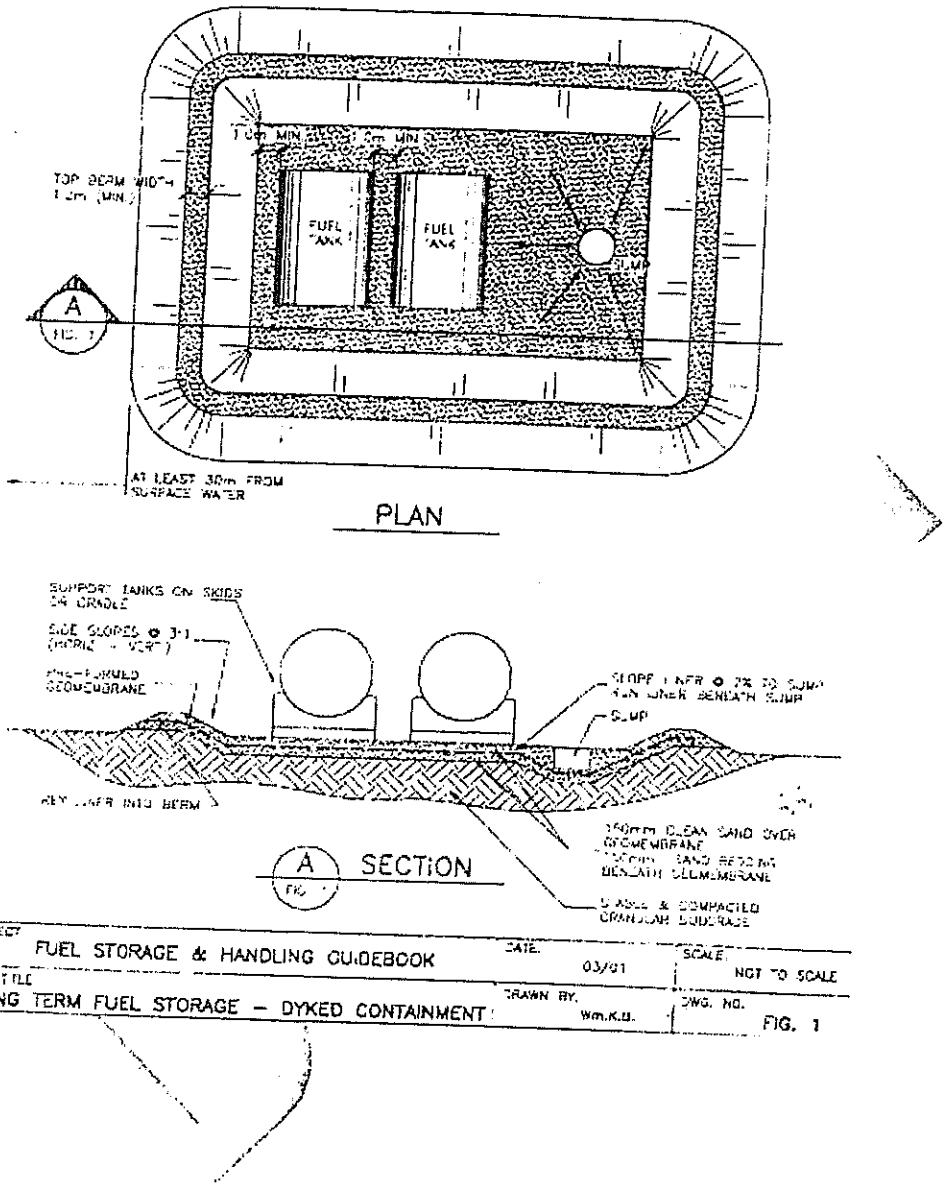
- Provide for the collection and removal of rainwater from the dyked area by sloping the entire liner at a two percent grade to a sump located at one end of the area. The liner should be sloped at about 5:1 (horizontal:vertical) at the sump to a depth of about 300 millimetres (one foot). A perforated bucket or other suitable container, wrapped in geotextile, can be set in place within the sump to serve as the dispensing point for draining rainwater;

- After the liner has been installed, but prior to placing the sand cover, it should be checked for leaks by filling with water and monitoring level drop after 24 hours. Punctures or tears can be field repaired with a kit from the manufacturer;

- Tanks should be placed no closer than one metre (3.3 foot) apart and should be no closer than one metre (3.3 foot) from the bottom edge of the outside berms. Extra space should be allowed for the sump at one end of the containment area; and

- If there is a drain valve or plug on the fuel tank, it must be closed or sealed or pad locked at all times.

Figure 1: Long-Term Fuel Storage-Dyked Containment



# Removal of Rainwater

When rainwater or snow accumulates within the dyked area, it must be removed in order to maintain the required storage volume for spill containment. However, since this water / snow may contain some hydrocarbons due to minor spills or leaks, it must be separated from the oil prior to discharging the water to the environment. Acceptable methods for rainwater removal are as follows:

## 1. Oil Water Separator

There are many commercial oil water separators on the market, and an option is to contact a local supplier and have them attend the site and dewater the containment as required. The main thing about separating oil and water is to allow enough time for oil droplets to float to the surface as water continuously flows underneath. The bigger the separator, the more quiet time there is for oil to collect at surface. Tiny oil droplets can form an emulsion with water. It might take too long for these small droplets to rise before the oil/water leaves the separator, so a three-chamber design is usually recommended. The first chamber would be the largest, allowing for most of the removal. The separator should be three times as long as it is wide, and three times as deep as it is wide. Minimum capacity should be about 45 gallons.

## 2. On-site Separation and Removal

If the amount of hydrocarbons in the containment area is relatively minor or apparently non-existent, then it may be cost effective to absorb any floating hydrocarbons from the water with the use of commercial sorbents especially designed to collect fuel.

## 3. Discharge limit criteria

Any rainwater or snow removed from the containment area must meet acceptable discharge limit criteria. Please refer to applicable legislation for details on acceptable discharge limits.

## Handling and Dispensing

- Ensure all containers are sealed when not in use;
- Ensure that every precaution is taken to avoid spillage during fuel transfers. Provide a dispensing area with drainage and liner to collect spilled product during transfer. High quality oil absorbent matt is effective for this purpose;
- Do not fill tanks to capacity, leave at least one percent air space for expansion of the product. Provide an overfill device, and use a dipstick to check fuel levels;
- All hoses and nozzles must be compatible with stored product;
- Ignition must be shut off and a no smoking policy enforced around all flammable liquids;
- Twenty-pound ABC fire extinguishers should be on site while handling fuel;
- Protect against static charge during transfer by connecting a metallic bond wire from the fill stem to the tank;
- Provide a valve which can be securely locked if the area is unsupervised;

• If using a portable pump to dispense fuel, the device must be thermally protected and approved for dispensing flammable and combustible liquids;
• Comply with requirement of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of material safety data sheets acceptable to Labour Canada and Health and Welfare Canada;
• Employees should be trained in safe handling of materials as well as in fire hazards and procedures to follow in an emergency. Refer to the MSDS (Materials Safety Data Sheet) for the product and review the emergency response and fire response methods for that product;
• Maintain appropriate spill equipment for emergency spill response; and
• Post Spill Response Plan at dispensing/storage site in plain view.

# CHEMICALS

Chemicals for use in land use applications must conform to the same storage and handling requirements that apply anywhere in Nunavut. These requirements come mainly from the Transportation of Dangerous Goods Act and Regulations (TDG) and from the Workplace Hazardous Materials Information System (WHMIS). Schedules I and II of the TDG Regulations list well over 2,000 chemical formulations and common products in use in Canada.

Guidelines which apply to fuel would apply to any chemical (eg 31 meters from high water mark – stable ground etc)

## *General Requirements*

Every chemical has its own particular characteristics, and its own storage and handling requirements. To comply with the regulations, the product specific Materials Handling Data Sheet (MSDS) must be consulted as to storage, handling, and emergency response measures. All chemical products must be labelled in accordance with WHMIS. The following are some common "chemicals" that may be used in mining applications and their general storage and handling requirements.

**Lead Acid Batteries**
The hazards of waste batteries come from the sulphuric acid and lead content. If they are poorly handled, they can harm garbage collectors, landfill workers, and people and animals scavenging at waste disposal sites. If they are smashed in an ordinary garbage dump, the lead and acid are released into the soil, which can result in contamination of groundwater by leachate. If you are storing or preparing larger amounts of batteries for collection or shipment, follow this procedure: Use sound wooden pallets. Place enough plastic sheeting over the pallet to cover all of the batteries top, bottom and sides. Stack the batteries not more than than two layers high, then enclose in the plastic sheeting.

**Antifreeze (Ethylene Glycol)**
Antifreeze is poisonous to people and animals and contains small mounts of metal contaminants. Similar to waste oil and batteries, it can contribute to contaminated leachate if thrown into common garbage dumps. Store antifreeze in containers similar to those used for waste oil, or in the manufacturer's container. Retain larger volumes for special waste collection or deliver to an approved special waste facility. Engage a company to recycle the antifreeze on site.

Solvents
Solvents used for cleaning, thinning, degreasing, and stripping such as mineral spirits, turpentine, petroleum distillates, varsol, and kerosene, are very toxic to people and animals. Some solvents cause cancer; some are combustible. When handling solvents, avoid contact with the skin or breathing fumes.

**Minimize** waste solvent (waste reduction). It may not be possible to avoid some final disposal, but it can be significantly reduced by:

- using a cleaning tank to collect and reuse solvent;
- not contaminating with water;
- removing sludge continuously;
- using detergent cleaners as an alternative; and
- pre-cleaning parts with detergent before resorting to solvent. Allow pieces to dry before cleaning.

Recover solvents. If using more than 200 litres per month, install a solvent reclamation unit. Small amounts of solvent can be recovered for re-use by simply letting the solvent settle in a clean container and then pouring off the clean solvent for re-use.

**Waste Paints**

Latex paints are not special waste. Oil-based paints, lacquers, enamel and sealers are toxic because of the solvent they contain. Old paint might contain metals or PCBs. About 80 percent of oil based paint can be recycled. Waste paint can be blended to produce grey paint, which can be used for primer. Share your waste paint – someone else may be able to use it. Refer to Special Waste Collection section mentioned previously.

**Asbestos**

Asbestos fibre was used for insulation and piping..If asbestos is found in the field contact Occupational Health and the Workmans Compensation Board for assistance.

**Calcium Cloride (CaCl)**

CaCl is identified as a toxic substance by Canadian Environmental Protection Act. If CaCl is to be used as a drill additive, ensure that all sumps containing CaCl are properly constructed and located in such a manner as to ensure that the contents will not enter any water body.

# WASTE PETROLEUM PRODUCTS

Used oil is one of the most common hazardous waste in Nunavut. When poorly stored or disposed of, used oil can leach into the soil and contaminate the soil itself or the groundwater. The most common types of used oil are crank case oil, gear oil, transmission fluid, and hydraulic oil. Contaminants such as metals, chlorinated solvents and glycol make used oil harmful to the environment. If used oil is carelessly disposed into ordinary garbage dumps, leachate may develop which can contaminate ground water and surrounding soil.

## *General Requirements*

A water licence or other permit for land use activities may include a clause that requires handling and disposal of waste oil "All waste petroleum products must be safely stored on site or be removed to a special waste disposal facility The general requirements of these regulations are that all waste oil above a certain quantity must be stored, transported and disposed in a way that protects the environment and human health and safety. As special waste, waste oil must be stored properly, be transported in line with the Transportation and Dangerous Goods Act Regulations, and be disposed of properly.

## *Handling and Disposal*

Unfortunately, at present, there are few practical options for dealing with large quantities of waste oil

in Nunavut. To dispose of routine amounts, consider mixing with fuel and burning it in heavy equipment. Very small quantities may be burned in approved waste oil incinerators. Larger amounts may be stored on site in containers or tanks. It may be transported and used in a waste oil burner at an approved facility, or it may be collected and transported outside for recycling.

**Mixing With Diesel Fuel:** Mixing of waste oil with diesel fuel for engines is allowed, providing that the mixture doesn't exceed 10 percent by volume of waste oil, and that the waste oil has first been passed through a five-micron filter. Caution: when the mix exceeds five percent, warranties may be affected.

**Incineration at Special Waste Facilities:** There are some approved waste oil burning facilities in Nunavut which have special waste permits allowing them to burn waste oil for the purpose of space heating. The furnace must meet a specification and the oil cannot be contaminated beyond allowable limits of metals and other contaminants including water, solvents, and antifreeze.

**Collection and Delivery to Outside Facilities:** Transporting waste oil off site requires a Transportation and Dangerous Goods permit, with the basic requirement being a waste manifest. This may be the only realistic alternative for large amounts of waste oil (greater than 1,000 gallons).

**On-Site Storage:** Waste oil storage must conform to the same requirements as fuel storage. Containers and tanks must meet specifications, and secondary containment must be provided.

# Appendix IV
# MSDS SHEETS

PETRO-CANADA

# Material Safety Data Sheet

| WHMIS (Pictograms) | WHMIS (Classification) | Protective Clothing | TDG (pictograms) |
|---|---|---|---|
|  | B-3, D-2B |  |  |

## *Section 1. Chemical Product and Company Identification*

| | | | |
|---|---|---|---|
| **Product Name** | **DIESEL FUEL** | **Code** | W104, W293<br>SAP: 120, 121, 122, 287 |
| **Synonym** | Diesel 50, Diesel 50 LS, #1 Diesel , #1 Diesel LS, Diesel LC, Seasonal Diesel, Seasonal Diesel LS, Diesel AA, Domestic Marine Diesel, International marine Diesel, Seasonal Diesel Locomotive, Domestic Marine diesel LS, diesel -20°C (LS), LSD, Low Sulphur Diesel, dyed diesel, marked diesel, coloured diesel, Naval Distillate, Ultra Low Sulphur Diesel, ULS Diesel, Mining Diesel, Mining Diesel Special, Mining Diesel Special LS, High Flash Mining Diesel, Furnace Oil, Stove Oil. | **Validated on** | **2/6/2004.** |
| **Manufacturer** | PETRO-CANADA<br>P.O. Box 2844<br>Calgary, Alberta<br>T2P 3E3 | **In case of Emergency** | Petro-Canada: 403-296-3000<br>Canutec Transportation: 613-996-6666<br>Poison Control Centre: Consult local telephone directory for emergency number(s). |
| **Material Uses** | Diesel fuels are distillate fuels suitable for use in high and medium speed internal combustion engines of the compression ignition type. Mining Diesel has a higher flash point requirement, for safe use in underground mines. | | |

## *Section 2. Composition and Information on Ingredients*

| | | | *Exposure Limits (ACGIH)* | | |
|---|---|---|---|---|---|
| **Name** | **CAS #** | **% (V/V)** | **TLV-TWA(8 h)** | **STEL** | **CEILING** |
| 1) Diesel oil. | 68334-30-5 | >99.9 | 100 mg/m³ (as total hydrocarbons) * | Not established | Not established |
| 2) Proprietary additives.<br><br>Aromatic content is 50% maximum (benzene: nil).<br>Sulphur content is 0-0.50%. | Not available | <0.1 | Not established | Not established | Not established |

| | |
|---|---|
| **Manufacturer Recommendation** | * Avoid prolonged or repeated skin contact to diesel fuels which can lead to dermal irritation and may be associated with an increased risk of skin cancer. |
| **Other Exposure Limits** | Consult local, state, provincial or territory authorities for acceptable exposure limits. |

## *Section 3. Hazards Identification.*

| | |
|---|---|
| **Potential Health Effects** | Combustible liquid. Exercise caution when handling this material. Contact with this product may cause skin and eye irritation. Prolonged or repeated contact may cause skin irritation, defatting, drying and dermatitis. Inhalation of this product may cause respiratory tract irritation and Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death. Ingestion of this product may cause gastro-intestinal irritation. Aspiration of this product may result in severe irritation or burns to the respiratory tract. For more information refer to Section 11 of this MSDS. |

## *Section 4. First Aid Measures*

| | |
|---|---|
| **Eye Contact** | IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Seek medical attention. |
| **Skin Contact** | Remove contaminated clothing - launder before reuse. Wash gently and thoroughly the contaminated skin with running water and non-abrasive soap. Seek medical attention. |
| **Inhalation** | Evacuate the victim to a safe area as soon as possible. If the victim is not breathing, perform artificial respiration. Allow the victim to rest in a well ventilated area. Seek medical attention. |
| **Ingestion** | DO NOT induce vomiting because of danger of aspirating liquid into lungs. Seek medical attention. |
| **Note to Physician** | Not available |

## Section 5. Fire-fighting Measures

| | | | |
|---|---|---|---|
| **Flammability** | Class II - combustible liquid (NFPA). | **Flammable Limits** | LOWER: 0.7%, UPPER: 6% (NFPA) |
| **Flash Points** | Diesel Fuel: Closed Cup: >40ºC (>104ºF)<br>Marine Diesel Fuel: Closed Cup: >60ºC (>140ºF)<br>Mining Diesel: Closed Cup: 52ºC (126ºF) | **Auto-Ignition Temperature** | 225ºC (437ºF) |
| **Fire Hazards in Presence of Various Substances** | Flammable in presence of open flames, sparks, or 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. | **Explosion Hazards in Presence of Various Substances** | Containers may explode in heat of fire. Do not cut, weld, heat, drill or pressurize empty container. Vapour explosion hazard indoors, outdoors or in sewers. Runoff to sewer may create fire or explosion hazard. |
| **Products of Combustion** | Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), sulphur compounds (H2S), water vapour (H2O), smoke and irritating vapours as products of incomplete combustion.<br>See Section 11 (Other Considerations) for information regarding the toxicity of the combustion products. | | |
| **Fire Fighting Media and Instructions** | NAERG96, GUIDE 128, Flammable liquids (Non-polar/Water-immiscible).<br>CAUTION: This product has a moderate flash point above 40ºC: Use of water spray when fighting fire may be inefficient.<br><br>If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also consider initial evacuation for 800 meters (1/2 mile) in all directions.<br><br>SMALL FIRES: Dry chemical, CO2, water spray or regular foam.<br>LARGE FIRES: Water spray, fog or regular foam. Do not use straight streams. Move containers from fire area if you can do it without risk.<br>Fires Involving Tanks or Car/Trailer Loads: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.<br><br>Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting devices or any discolouration of tank. ALWAYS stay away from the ends of tanks. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible withdraw from area and let fire burn. Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection. | | |

## Section 6. Accidental Release Measures

| | |
|---|---|
| **Material Release or Spill** | Consult current National Emergency Response Guide Book (NAERG) for appropriate spill measures if necessary. IN THE EVENT OF A LARGE SPILL CONSIDER THE FOLLOWING CONTROL MEASURES: Extinguish all ignition sources. Stop leak if safe to do so. Ventilate area. Dike spilled material. Use appropriate inert absorbent material to absorb spilled product. Collect used absorbent for later disposal. Avoid contact with spilled material. Avoid breathing vapours or mists of material. Avoid contaminating sewers, streams, rivers and other water courses with spilled material. Evacuate non-essential personnel. Ensure clean-up personnel wear appropriate personal protective equipment. Ground and bond all equipment used to clean up the spilled material, as it may be a static accumulator. Notify appropriate authorities immediately. |

## Section 7. Handling and Storage

| | |
|---|---|
| **Handling** | COMBUSTIBLE MATERIAL. Handle with care. Avoid contact with any sources of ignition, flames, heat, and sparks. Avoid skin contact. Avoid eye contact. Avoid inhalation of product vapours or mists. Empty containers may contain product residue. Do not pressurize, cut, heat, or weld empty containers. Do not reuse containers without commercial cleaning and/or reconditioning. Personnel who handle this material should practice good personal hygiene during and after handling to help prevent accidental ingestion of this product. Properly dispose of contaminated leather articles including shoes that cannot be decontaminated. Avoid confined spaces and areas with poor ventilation. Ensure all equipment is grounded/bonded. Wear proper personal protective equipment (See Section 8). |
| **Storage** | Store away from heat and sources of ignition. Store in dry, cool, well-ventilated area. Store away from incompatible and reactive materials (See section 5 and 10). Ensure the storage containers are grounded/bonded. |

## Section 8. Exposure Controls/Personal Protection

| | |
|---|---|
| **Engineering Controls** | For normal application, special ventilation is not necessary. If user's operations generate vapours or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. Make-up air should always be supplied to balance air removed by exhaust ventilation. Ensure that eyewash station and safety shower are close to work-station. |
| **Personal Protection** - ***The selection of personal protective equipment varies, depending upon conditions of use.*** | |
| **Eyes** | Eye protection (i.e., safety glasses, safety goggles and/or face shield) should be determined based on conditions of use. If product is used in an application where splashing may occur, the use of safety goggles and/or a face shield should be considered. |
| **Body** | Wear appropriate clothing to prevent skin contact. As a minimum long sleeves and trousers should be worn. |
| **Respiratory** | Where concentrations in air may exceed the occupational exposure limits given in Section 2 (and those applicable to your area) and where engineering, work practices or other means of exposure reduction are not adequate, NIOSH approved respirators may be necessary to prevent overexposure by inhalation. |
| **Hands** | Wear appropriate chemically protective gloves. When handling hot product ensure gloves are heat resistant and insulated. |
| **Feet** | Wear appropriate footwear to prevent product from coming in contact with feet and skin. |

## Section 9. Physical and Chemical Properties

| | | | |
|---|---|---|---|
| **Physical State and Appearance** | Bright oily liquid. | **Viscosity** | 1.3 - 4.1 cSt @ 40ºC (104ºF) |
| **Colour** | Clear to yellow / brown (may be dyed for taxation purposes). | **Pour Point** | Variable, -50ºC to 0ºC (-58ºF to -32ºF) |
| **Odour** | Petroleum oil like. | **Softening Point** | Not applicable. |
| **Odour Threshold** | Not available | **Dropping Point** | Not applicable. |
| **Boiling Point** | 150 - 371ºC (302-700ºF) | **Penetration** | Not applicable. |
| **Density** | 0.80 - 0.85 kg/L @ 15ºC (59ºF) | **Oil / Water Dist. Coefficient** | Not available |
| **Vapour Density** | 4.5 (Air = 1) | **Ionicity (in water)** | Not applicable. |
| **Vapour Pressure** | Not available | **Dispersion Properties** | Not available |
| **Volatility** | Semivolatile to volatile. | **Solubility** | Insoluble in cold water, soluble in non-polar hydrocarbon solvents. |

## Section 10. Stability and Reactivity

| | | | |
|---|---|---|---|
| **Corrosivity** | Not available | | |
| **Stability** | The product is stable under normal handling and storage conditions. | **Hazardous Polymerization** | Will not occur under normal working conditions. |
| **Incompatible Substances / Conditions to Avoid** | Reactive with oxidizing agents and acids. | **Decomposition Products** | May release COx, NOx, SOx, H2S, H2O, smoke and irritating vapours when heated to decomposition. |

## Section 11. Toxicological Information

| | |
|---|---|
| **Routes of Entry** | Skin contact, eye contact, inhalation, and ingestion. |
| **Acute Lethality** | Acute oral toxicity (LD50): 7500 mg/kg (rat). |
| **Chronic or Other Toxic Effects** | |
| Dermal Route: | This product contains a component (at >= 1%) that can cause skin irritation. Therefore, this product is considered to be a skin irritant. Prolonged or repeated contact may defat and dry skin, and cause dermatitis. (See Other Considerations) |
| Inhalation Route: | Inhalation of this product may cause respiratory tract irritation. Inhalation of this product may cause Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death. |
| Oral Route: | Ingestion of this product may cause gastro-intestinal irritation. Aspiration of this product may result in severe irritation or burns to the respiratory tract. Ingestion of this product may cause Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death. |
| Eye Irritation/Inflammation: | This product contains a component (at >= 1%) that can cause eye irritation. Therefore, this product is considered to be an eye irritant. |
| Immunotoxicity: | Not available |
| Skin Sensitization: | Contact with this product is not expected to cause skin sensitization, based upon the available data and the known hazards of the components. |
| Respiratory Tract Sensitization: | Contact with this product is not expected to cause respiratory tract sensitization, based upon the available data and the known hazards of the components. |
| Mutagenic: | This product is not known to contain any components at >= 0.1% that have been shown to cause mutagenicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a mutagen. |
| Reproductive Toxicity: | This product is not known to contain any components at >= 0.1% that have been shown to cause reproductive toxicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a reproductive toxin. |
| Teratogenicity/Embryotoxicity: | This product is not known to contain any components at >= 0.1% that have been shown to cause teratogenicity and/or embryotoxicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a teratogen/embryotoxin. |
| Carcinogenicity (ACGIH): | ACGIH A3: animal carcinogen. [Diesel oil] (See Other Considerations) |
| Carcinogenicity (IARC): | This product is not known to contain any chemicals at reportable quantities that are listed as Group 1, 2A, or 2B carcinogens by IARC. |
| Carcinogenicity (NTP): | This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by NTP. |
| Carcinogenicity (IRIS): | This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by IRIS. |

| | |
|---|---|
| Carcinogenicity (OSHA): | This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by OSHA. |
| **Other Considerations** | Avoid prolonged or repeated skin contact to diesel fuels which can lead to dermal irritation and may be associated with an increased risk of skin cancer.<br><br>Diesel engine exhaust particulate is probably carcinogenic to humans (IARC Group 2A). |

## *Section 12. Ecological Information*

| | | | |
|---|---|---|---|
| **Environmental Fate** | Not available | **Persistance/ Bioaccumulation Potential** | Not available |
| **BOD5 and COD** | Not available | **Products of Biodegradation** | Not available |
| **Additional Remarks** | No additional remark. | | |

## *Section 13. Disposal Considerations*

| | |
|---|---|
| **Waste Disposal** | Spent/ used/ waste product may meet the requirements of a hazardous waste. Consult your local or regional authorities. Ensure that waste management processes are in compliance with government requirements and local disposal regulations. |

## *Section 14. Transport Information*

| | | | |
|---|---|---|---|
| **TDG Classification** | DIESEL FUEL, 3, UN1202, PGIII (CL-TDG) | **Special Provisions for Transport** | See Transportation of Dangerous Goods Regulations. |

## *Section 15. Regulatory Information*

| | |
|---|---|
| **Other Regulations** | This product is acceptable for use under the provisions of WHMIS-CPR. All components of this formulation are listed on the CEPA-DSL (Domestic Substances List).<br><br>All components of this formulation are listed on the US EPA-TSCA Inventory.<br><br>All components of this product are on the European Inventory of Existing Commercial Chemical Substances (EINECS).<br><br>This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.<br><br>Please contact Product Safety for more information. |

| | | | |
|---|---|---|---|
| **DSD/DPD (Europe)** | Not evaluated. | **HCS (U.S.A.)** | CLASS: Irritating substance.<br>CLASS: Target organ effects.<br>CLASS: Combustible liquid having a flash point between 37.8°C (100°F) and 93.3°C (200°F). |
| **ADR (Europe) (Pictograms)** | **NOT EVALUATED FOR EUROPEAN TRANSPORT**<br><br>**NON ÉVALUÉ POUR LE TRANSPORT EUROPÉEN.** | **DOT (U.S.A) (Pictograms)** |  |

**HMIS (U.S.A.)**

| | |
|---|---|
| **Health Hazard** | 2* |
| **Fire Hazard** | 2 |
| **Reactivity** | 0 |
| **Personal Protection** | H |

**NFPA (U.S.A.)**


| Rating | |
|---|---|
| 0 | Insignificant |
| 1 | Slight |
| 2 | Moderate |
| 3 | High |
| 4 | Extreme |

## *Section 16. Other Information*

**References** Available upon request.

* Marque de commerce de Petro-Canada - Trademark

### Glossary

ACGIH - American Conference of Governmental Industrial Hygienists
ADR - Agreement on Dangerous goods by Road (Europe)
ASTM - American Society for Testing and Materials (
BOD5 - Biological Oxygen Demand in 5 days
CAN/CGA B149.2 Propane Installation Code
CAS - Chemical Abstract Services
CEPA - Canadian Environmental Protection Act
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CFR - Code of Federal Regulations
CHIP - Chemicals Hazard Information and Packaging Approved Supply List
COD5 - Chemical Oxygen Demand in 5 days
CPR - Controlled Products Regulations
DOT - Department of Transport
DSCL - Dangerous Substances Classification and Labeling (Europe)
IRIS - Integrated Risk Information System
LD50/LC50 - Lethal Dose/Concentration kill 50%
LDLo/LCLo - Lowest Published Lethal Dose/Concentration
NAERG'96 - North American Emergency Response Guide Book (1996)
NFPA - National Fire Prevention Association
NIOSH - National Institute for Occupational Safety & Health
NPRI - National Pollutant Release Inventory
NSNR - New Substances Notification Regulations (Canada)
NTP - National Toxicology Program
OSHA - Occupational Safety & Health Administration
PEL - Permissible Exposure Limit
RCRA - Resource Conservation and Recovery Act
SARA - Superfund Amendments and Reorganization Act
SD - Single Dose
STEL - Short Term Exposure Limit (15 minutes)

DSD/DPD - Dangerous Substances or Dangerous Preparations Directives (Europe)
DSL - Domestic Substance List
EEC/EU - European Economic Community/European Union
EINECS - European Inventory of Existing Commercial Chemical Substances
EPCRA - Emergency Planning and Community Right to Know Act
FDA - Food and Drug Administration
FIFRA - Federal Insecticide, Fungicide and Rodenticide Act
HCS - Hazardous Communication System
HMIS - Hazardous Material Information System
IARC - International Agency for Research on Cancer
TDG - Transportation Dangerous Goods (Canada)
TDLo/TCLo - Lowest Published Toxic Dose/Concentration
TLm - Median Tolerance Limit
TLV-TWA - Threshold Limit Value-Time Weighted Average
TSCA - Toxic Substances Control Act
USEPA - United States Environmental Protection Agency
USP - United States Pharmacopoeia
WHMIS - Workplace Hazardous Material Information System

**For Copy of MSDS**
**Internet: www.petro-canada.ca/msds**

**Western Canada, Ontario & Central Canada, telephone: 1-800-668-0220; fax: 1-800-837-1228**
**Quebec & Eastern Canada, telephone: 514-640-8308; fax: 514-640-8385**

**For Product Safety Information: (905) 804-4752**

**Prepared by Product Safety - JDW on 2/6/2004.**

**Data entry by Product Safety - JDW.**

# Section 1: Product & Company Information

**Product Name:** Chembreak ECA

**Chemical Family:** Enzymes and Acid blend

**Product Use:** Drilling Mud Additive

## Workplace Hazardous Materials Information Systems Data (WHMIS):

| | Class ID | Class | Workplace Hazard |
|---|---|---|---|
|  | D-2-A | Materials Causing Other Toxic Effects - Very Toxic | Toxic effects |
|  | D-2-B | Materials Causing Other Toxic Effects - Toxic | Skin and eye irritant |

**Manufacturer Name:** Bri-Chem Supply Ltd.

**Address:** #15, 53016 Highway 60, Acheson, AB T5X 5A7 Canada

**General Phone Number:** (780) 455-8667

**General Fax Number:** (780) 451-4420

**MSDS Revision Date:** January 1, 2008

**Supercedes:** January 1, 2005

**Prepared By:** Bri-Chem Supply Ltd.

**Preparer's Phone:** (780) 455-8667

# Section 2: Composition/Information on Ingredients

| Chemical Name | Concentration | CAS# |
|---|---|---|
| Citric Acid | 30-60% | 77-92-9 |
| Amylase | 1-5% | 9000-90-2 |

# Section 3: Hazards Identification

**Emergency Overview:**

## Routes of Entry:

**Skin Contact:** Yes

**Skin Absorption:** No

**Eye Contact:** Yes

**Inhalation:** Yes

**Ingestion:** Yes

### Potential Health Effects:

| | |
|---|---|
| **Skin:** | May cause irritation |
| **Eye:** | May cause irritation |
| **Inhalation:** | Dust may irritate the nose and throat. Inhalation may cause irritation of the mucous membranes. |
| **Ingestion:** | May cause gastrointestinal irritation and dental erosion. |

## Section 4: First Aid Measures

| | |
|---|---|
| **Eye Contact:** | Flush eyes with water for at least 15 minutes, seek medical attention. |
| **Skin Contact:** | Wash with soap and water. If irritation develops or persists, seek medical attention. Contaminated clothing should be washed before reuse. |
| **Inhalation:** | Remove victim to fresh air. If breathing has stopped administer CPR and seek medical attention. |
| **Ingestion:** | If conscious give 2 to 4 glasses of water to drink, but DO NOT induce vomiting. Get medical attention. Do not give anything by mouth to an unconscious or convulsing person. |

**Other First Aid:**

## Section 5: Fire Fighting Measures

| | |
|---|---|
| **Conditions Of Flammability:** | Not Determined |
| **Extinguishing Media:** | Dry chemical, $CO_2$, foam. |
| **Flashpoint:** | Not Determined |
| **Upper Flammable Limit:** | Not Determined |
| **Lower Flammable Limit:** | Not Determined |
| **Autoignition Temperature:** | Not Determined |
| **Protective Equipment:** | Firefighters must wear appropriate breathing apparatus and clothing. |
| **Sensitivity To Impact or Static Discharge:** | None known |
| **Hazardous Combustion Products:** | $CO_x$ on combustion |

**Fire Comment:**

## Section 6: Accidental Release Measures

**Personnel Precautions:** Use proper personal protective equipment as listed in section 8.

**Spill Cleanup Measures:** Use appropriate safety equipment. Small spills, sweep up and put into approved DOT containers for disposal or reuse. Large spills, do not allow to enter waterways, sweep or shovel into approved DOT containers for reuse or disposal.

## Section 7: Handling & Storage

**Handling:** Avoid ingestion. Practice reasonable caution and personal cleanliness. Avoid skin and eye contact.

**Storage:** Store in a cool, dry, well ventilated place. Keep container tightly closed and away from incompatible materials.

## Section 8: Exposure Controls, Personal Protection, Exposure Guidelines

**Engineering Controls:** None known

**Personal Protective Equipment:** Chemical resistant clothing is recommended including gloves, apron and goggles.

**Respiratory Protection:** In absence of proper ventilation, recommended NIOSH approved dust resirator.

**Exposure Limits:** Not Determined

| Chemical Name | ACGIH TLV-TWA | OSHA PEL-TWA |
|---|---|---|
| Citric Acid | Not Determined | Not Determined |
| Amylase | Not Determined | Not Determined |

## Section 9: Physical & Chemical Properties

**Physical State:** Powder

**Odour And Appearance:** White Odourless

**Odour Threshold:** Not Determined

**Boiling Point:** Not Applicable

**Evaporation Rate:** Not Determined

**Melting Point:** Not Determined

**Freezing Point:** Not Determined

**Density:** 1.54

**Vapour Density:** Not Determined

| | |
|---|---|
| **Vapour Pressure:** | Not Determined |
| **pH:** | 2.6 @ 10%, 2.4 @ 20% (wt/v) |
| **Flash Point:** | Not Determined |
| **Volatility (% by volume):** | Not Determined |
| **Coefficient of Water to Oil distribution:** | Not Determined |

## Section 10: Stability & Reactivity

| | |
|---|---|
| **Chemical Stability:** | Yes |
| **Hazardous Polymerization:** | Will not occur |
| **Conditions Of Chemical Instability:** | |
| **Incompatible Substances:** | Alkali metals, organic acids, oxides of sulphur and strong bases. |
| **Special Decomposition Products:** | $CO_x$ on combustion |

## Section 11: Toxicological Information

| Chemical Name | $LD_{50}$ (Oral Rat) | $LD_{50}$ (Dermal Rabbit) | $LC_{50}$ (Inhalation Rat) |
|---|---|---|---|
| Citric Acid | 3000mg/kg | Not Determined | Not Determined |
| Amylase | Not Determined | Not Determined | Not Determined |

| | |
|---|---|
| **Effects Of Acute Exposure:** | Not Determined |
| **Effects Of Chronic Exposure:** | Repeated inhalation of enzyme aerosols may cause respiratory tract sensitization in susceptible individuals. Symptoms include shortness of breath, skin rashes and irritation to eyes. |
| **General Irritancy Of Product:** | Not Determined |
| **Sensitization:** | Not Determined |
| **Carcinogenicity:** | Not Determined |
| **Reproductive Toxicity:** | Not Determined |
| **Teratogenicity:** | Not Determined |
| **Embryotoxicity:** | Not Available |
| **Mutagenicity:** | Not Determined |
| **Synergistic Products:** | Not Determined |

## Section 12: Ecological Information

**Ecotoxicity:** Not Available

**Environmental Fate:** Not Available

## Section 13: Disposal Considerations

**Waste Disposal:** All waste should be disposed of according to Federal, Provincial and local regulations. Containers should NOT be reused. Containers should be disposed of in accordance with government regulations.

## Section 14: Transport Information

**TDG Classification:** Not Regulated

**DOT UN Number:** Not Regulated

**Shipping Notes:** No special requirements.

## Section 15: Regulatory Information

### Workplace Hazardous Materials Information Systems Data (WHMIS):

| | Class ID | Class | Workplace Hazard |
|---|---|---|---|
|  | D-2-A | Materials Causing Other Toxic Effects - Very Toxic | Toxic effects |
|  | D-2-B | Materials Causing Other Toxic Effects - Toxic | Skin and eye irritant |

This product has been classified according to the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

## Section 16: Additional Information

**MSDS Revision Date:** January 1, 2008

**MSDS Revision Notes:**

**MSDS Author:** Bri-Chem Supply Ltd.

**Disclaimer:** This Health and Safety Information is correct to the best of our knowledge and belief at the date of its publication but we cannot accept liability for any loss, injury or damage which may result from its use. We shall ensure, so far as is reasonably practicable, that any revision of this Data Sheet is sent to all customers to whom we have directly supplied this substance, but must point out that it is the responsibility of any intermediate supplier to ensure that such revision is passed to the ultimate user. The information given in the Data Sheet is designed only as a guidance for safe handling, storage and the use of the substance. It is not a specification nor does it guarantee any specific properties. All chemicals should be handled only by competent personnel, within a controlled environment. Should further information be required, this can be obtained through the sales office whose address is at the top of this data sheet.

# MATERIAL SAFETY DATA SHEET

## 1. PRODUCT COMPANY AND IDENTIFICATION

**Trade Name** **Guar Gum 80%, Xanthan Gum 20% / Spirit Clay Free**

**Generic Description** Biopolymer

**Manufacturer/Supplier** Dynamic/Spirit Drilling Fluids.
**Address** 216 16th Street, Suite 915, Denver Co. 80202

## 2. COMPOSITION/INFORMATION ON THE COMPONENTS

| **Material or Component** | **CAS Number** | **Percentage** |
|---|---|---|
| Proprietary Biopolymer Blend | | |

## 3. HAZARD IDENTIFICATION

**Hazard Data: Contains no hazardous ingredients**

| | | |
|---|---|---|
| **Health** | 1 | |
| **Flammability** | 0 | |
| **Reactivity** | 0 | Ratings based on NPFA |

**Inhalation:**
Irritating to the respiratory tract if inhaled. The OSHA PEL for respirable dust is 5 mg/m3 and 15 mg/m3 for total dust.

**Skin Contact:**
May be irritating to the skin. Repeated or prolonged contact may cause drying and cracking of the skin.

**Eye Contact:**
May cause irritation to the eyes.

**Ingestion:**
Not anticipated route of exposure. May cause irritation of digestive tract.

**Chronic Health Effects**
None known.

**Medical Conditions Aggravated by Exposure**

None known.

## 4. FIRST AID MEASURES

**Inhalation:**
Remove person to fresh air. Get medical attention for any breathing difficulty.

**Skin Contact:**
Immediately wash exposed area with soap and water. Get medical advice if irritation develops.

**Eye Contact:**
Immediately flush eyes with large amounts of running water for at least 15 minutes. Get medical advice if irritation develops.

**Ingestion:**
If large amounts were ingested, give water to drink and get medical advice.

**Advice to Physicians**
Treat symptomatically.

## 5. FIRE FIGHTING MEASURES

| | |
|---|---|
| **Flash Point** | Not applicable |
| **Flammable Limits** | Not applicable |
| **Fire Extinguishing Media** | Water, foam, sand, dry chemical or carbon dioxide ($CO_2$) |
| **Unusual Fire and Explosion Hazard** | None |

## 6. ACCIDENTAL RELEASE MEASURES

**Release or Spill**
Collect and place in suitable container for reuse or disposal.

**Personal Precautions**
Keep away from heat and sources of ignition. Avoid breathing dust.

**Environmental Precautions**
None

## 7. HANDLING AND STORAGE

Store in a cool, dry, ventilated area. Keep container tightly closed when not in use. Use good housekeeping in storage and work areas to prevent accumulation of dust. Keep away from oxidizing agents and extreme heat.

## 8. EXPOSURE CONTROL/PERSONAL PROTECTION

**Airborne Exposure Limits**
OSHA Permissible Exposure Limit (PEL) 15 mg/m3 total dust, 5 mg/m3 respirable fraction for nuisance dusts.

**Ventilation Requirements:**
A system of local and/or general exhaust is recommended if handled in a confined area to keep airborne levels below recommended exposure limits..

**Respiratory Protection**
Use NIOSH approved nuisance dust respirator.

**Skin Protection**
Wear long sleeved clothing and work gloves.

**Eye Protection**
Wear safety glasses with side shields. Maintain eye wash station in work area.

**Other Protection Equipment/Clothing**
As appropriate for work area.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|---|
| **Physical State** | Powder |
| **Color** | Light yellow |
| **Odor** | None |
| **pH (1% soln/water)** | 7 |
| **Specific Gravity** | 0.8 |
| **Boiling Range/Point** | Not applicable |
| **Flash Point** | Not applicable |
| **Explosion Limits (%)** | Not applicable |
| **Solubility in Water** | Slight |
| **Vapor Density (Air=1)** | Not applicable |
| **Evaporation Rate (butyl acetate=1)** | Not applicable |

## 10. STABILITY AND REACTIVITY

**Stability:** Stable under normal conditions of use and storage.

**Materials to Avoid:** Excessive heat, ignition sources and strong oxidizers.

**Hazardous Polymerization:** Will not occur.

**Hazardous Decomposition: CO, CO2**

## 11. TOXICOLOGICAL INFORMATION

No acute toxicity data is available for product or components**.**

## 12. ECOLOGICAL INFORMATION

No ecotoxicity data is available. This product is not expected to present an environmental hazard.

## 13. DISPOSAL

Dispose of material in accordance with all local, state, and federal regulations.

## 14. TRANSPORTATION INFORMATION

| | |
|---|---|
| **UN Proper Shipping Name** | Not regulated |
| **UN Label** | None |
| **UN Identification Number** | None |
| **Hazardous Ingredients** | None |
| **Placards** | None |
| **Reportable Quantity** | None |

## 15. REGULATORY INFORMATION

| | |
|---|---|
| **TSCA Listed** | Yes |
| **SARA Title III Section 302** | No |
| **SARA Title III Section 311/312** | No |
| **SARA Title III Section 313** | No |
| **WHMIS (Canada):** | Not a controlled product |
| **DSL (Canada)** | Listed |

## 16. OTHER INFORMATION

Abbreviations
N/A: Denotes no applicable information found or available
CAS#: Chemical Abstracts Service Number
ACGIH: American Conference of Governmental Industrial Hygienists
OSHA: Occupational Safety and Health Administration
TLV: Threshold Limit Value
PEL: Permissible Exposure Limit
STEL: Short Term Exposure Limit
NTP: National Toxicology Program
IARC: International Agency for Research on Cancer
LC50: Lethal Concentration 50%
LD50: Lethal Dose 50%
BOD: Biological Oxygen Demand

MSDS Date: 09/2007

Disclaimer: All information and recommendations concerning product is based on tests and data believed to be reliable; however it is the user's responsibi
determine the safety, toxicity and suitability for the user's own use of the product described herein. Since the actual use by others is beyond our control, no
guarantee expressed or implied is made by Dynamic/Spirit Drilling Fluids. Nor is the information herein to be construed as absolutely complete since addi
information may be necessary or desirable when particular conditions exist or because of applicable laws or government regulations.