Hazardous Materials Management Plan

Doris North Project, Nunavut

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1.0 INTRODUCTION

1.1 Purpose & Scope of these Procedures

The purpose of this document is to provide a consolidated summary of information on the safe and environmentally sound transportation, storage, and handling of the major hazardous products to be used at the Doris North Project both during the construction and operational phases. These procedures are an integral component of the overall Environmental Protection Plan (EPP) for the proposed Doris North Project and will be periodically reviewed and updated as the Project moves through construction, operations, and final closure and reclamation. It should be noted that many of the hazardous materials discussed in these procedures are to be used in the extraction of gold in the mill and consequently will not be shipped to or used on site until the beginning of the operational phase (shipped on the second construction sea lift in the summer of 2008).

This Management Plan is a component of the Doris North Environmental Management System and will be updated after the water license has been issued to incorporate any new commitments made by Miramar Hope Bay Ltd. (MHBL) during the license process and to incorporate any conditions contained within the water license relating to the handling and management of hazardous materials. This Management Plan is to be reviewed annually during the first quarter of each calendar year by the mine's environmental staff and updated as needed to reflect changes in operating procedures. The revised Hazardous Materials Management Plan (HMMP) will be made available to the appropriate mine operating staff with appropriate refresher training and sent to the Nunavut Water Board (NWB) for inclusion in the public registry.

The Hazardous Materials Management Plan is intended to provide the mine's operating staff with a summary of the hazardous materials handling and management procedures developed through the environmental assessment and project design process. It similarly provides a summary of the same to the regulatory agencies and to the land owner who have regulatory interest over the mine facilities.

This Plan is not intended to be a design document for the hazardous material management facilities. The reader is referred to the following sources for design information:

- Design of the Surface Infrastructure Components Doris North Project, Hope Bay, Nunavut, Canada, prepared for MHBL by SRK Consulting Engineers and Scientists, dated March 2007. (Supporting Document S2 to the Revised Water License Application Support Document, April 2007)
    - Sections 4.6 and 5.5.2 Beach Laydown Area;
    - Sections 4.8 and 5.5.3 Explosives Storage Facility;
    - Sections 4.9 and 5.6 Fuel Transfer Station; and
    - Sections 4.10 and 5.6 Fuel Tank Farm.

- Engineering Drawings for Tailings Containment Area and Surface Infrastructure Components, Doris North Project, Nunavut, Canada, prepared for MHBL by SRK

Consulting Engineers and Scientists, dated March 2007. (Supporting Document S4 to the Revised Water License Application Supporting Document, April 2007)
  - Drawing G-02 General Arrangement;
  - Drawings S-01 and S-02 Beach Laydown Area and Fuel Transfer Station Plan. Typical Section and Details;
  - Drawings S-04 Explosives Facility Plan, Typical Sections and Detail;
  - Drawings S-05 and S-06 Fuel Tank Farm Plan, Typical Sections and Details; and
  - Drawings S-07 and S-08 Camp and Mill Pad Plan, Typical Sections and Details.

- Technical Specifications for Tailings Containment Area and Surface Infrastructure Components, Doris North Project, Hope Bay, Nunavut, Canada, prepared for MHBL by SRK Consulting Engineers and Scientists, dated March 2007. (Supporting Document S3 to the Revised Water License Application Support Document, April 2007)
  - Section 10.2.4 Beach Laydown Area;
  - Section 10.2.5 Fuel Transfer Station;
  - Section 10.2.6 Explosives Storage Facility;
  - Section 10.2.9 Fuel Tank Farm;
  - Section 10.2.11 Mill Pad;
  - General material specifications for fill materials is contained in Section 7;
  - General specifications for geosynthetics is contained in Section 8; and
  - General specifications for fill placement is contained in Section 9.

1.2 Definition of Hazardous Material and General Control Procedures

A hazardous material is one that, as a result of its physical, chemical, or other properties, poses a potential hazard to human health or the environment when it is improperly handled, used, stored, disposed of, spilled or otherwise managed. In combination with MHBL's Emergency Response and Contingency Plan[1], the Hazardous Materials Management Plan provides instruction on the prevention, detection, containment, response, and mitigation of accidents that could result from handling of hazardous materials at the proposed Doris North Project.

These procedures are based on the following principles for best practice management of hazardous materials:

- Purchasing controls – control of shipping methods, appropriate packaging, shipping schedules, etc.;
- Shipment Tracking procedures;
- Inventory controls on site – periodic inventory of materials in storage on site to determine usage and to identify and manage any unexpected loss;
- Maintenance of current safe handling and storage procedures – MSDS (Material Safety Data Sheets), WHMIS (Workplace Hazardous Materials Identification

[1] Emergency Response and Contingency Plan, Supporting Document S10a to the Revised Water License Application Support Document, April 2007.

System), TDG (Transportation of Dangerous Goods) data and labelling – made available to those in contact throughout the operational site;
- Characterization of potential environmental hazards posed by these materials through the Environmental Management System;
- Allocation of clear responsibility for managing shipment, storage, handling and use of potentially hazardous materials;
- Defined methods for transport, storage, handling, and use;
- Identification of disposal methods for potentially hazardous waste generated from use of these products;
- Preparation of contingency and emergency response plans;
- Adequate type and delivery of training for management, workers, and contractors whose responsibilities include handling potentially hazardous materials;
- Maintenance and review of records of hazardous material consumption and incidents in order to anticipate and avoid impacts on personal health and the environment; and
- Procedures to track and manage wastes generated through use of these products, including regular shipments of potentially hazardous waste to appropriate licensed disposal facilities following all relevant regulatory requirements (packaging, labelling, inventory tracking and waste manifesting).

MHBL requires that the transportation, storage, handling and use of hydrocarbon based products, ammonium nitrate, and all other chemicals to be used at the proposed Doris North Project be conducted in a safe and efficient manner. Prevention, detection, containment, response, and mitigation are the key elements in the management of hazardous materials. MHBL is committed to minimizing the potential for adverse environmental effects on terrestrial and aquatic biota and ecosystems that may result from accidental release. The first step in accomplishing this is to apply consistent practices towards the management of hazardous materials site-wide. MHBL will incorporate proper hazardous material management procedures into its environmental management plans and systems for the proposed Doris North Project to reduce risk of accidental release.

All hazardous materials to be used at the Doris North operation will be manufactured, delivered, stored, and handled in compliance with all applicable federal and territorial regulations. MHBL is strongly committed to preventing, to the greatest extent possible, both inadvertent release of these substances to the environment and accidents resulting from mishandling or mishap. MHBL will institute programs for employee training, facility inspection, periodic drills to test systems, and procedural review to address deficiencies, accountability, and continuous improvement objectives.

MHBL will actively work towards minimizing the generation of hazardous wastes by investigating alternatives to the use of hazardous materials, by recycling products and containers wherever feasible, and by treating wastes using state-of-the-art technologies before any release to the environment.

As with all other aspects of the health and safety policy at the Doris North mine, all employees will be expected to comply with all applicable precautions and handling procedures with regard to hazardous materials. Employees are also expected to report any

concerns to their supervisors, the Health and Safety Committee, or senior site management. All staff are encouraged to bring forward suggestions for improvements that can be incorporated into future procedure revisions as appropriate.

Figure 1-1 presents a map of the proposed Doris North Project site to aid the reader in identifying key infrastructure areas when reading through this HMMP.

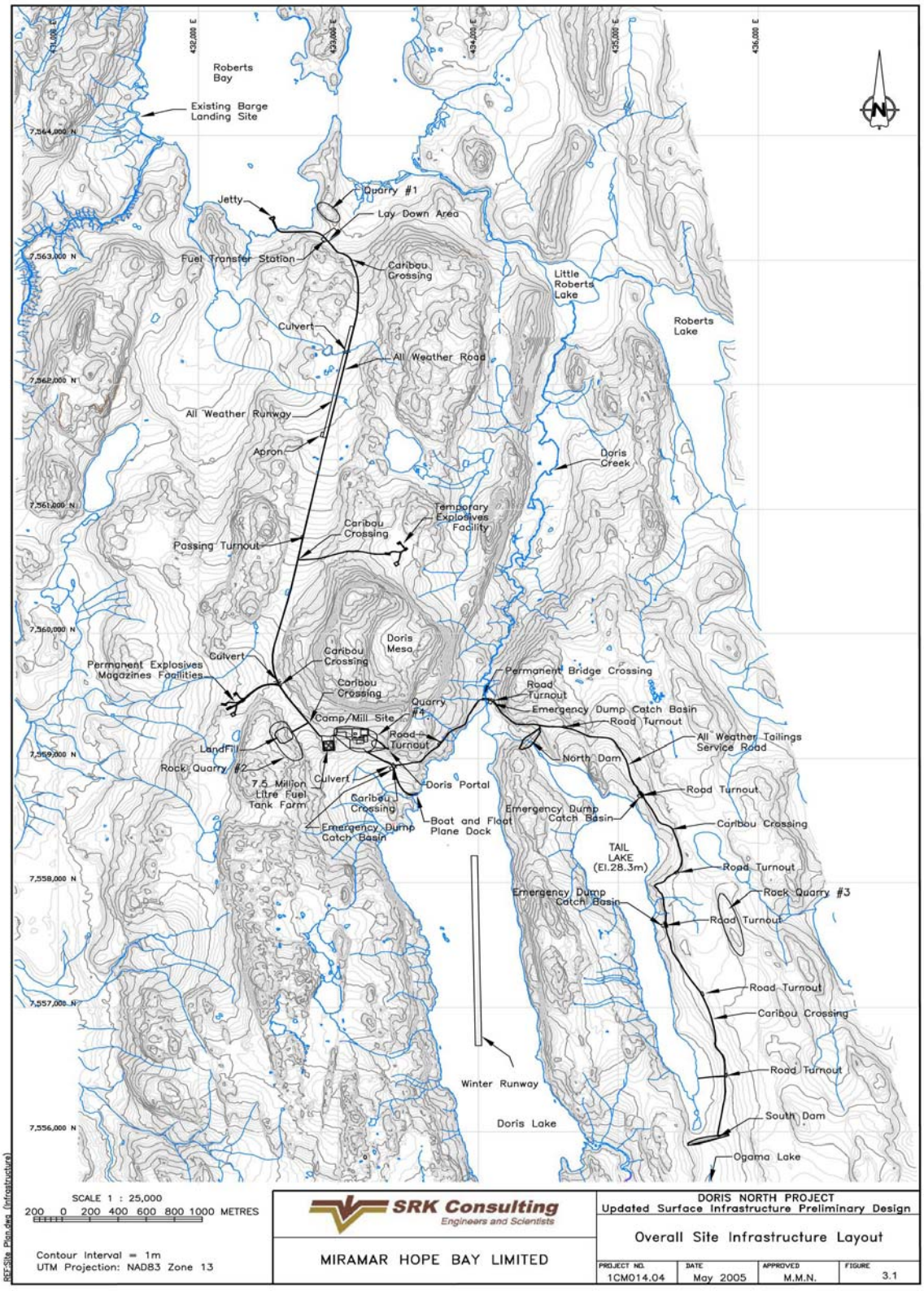


Figure 1.1: Site Map

1.3 Applicable Legislation

Both federal and territorial legislation regulates the management of hazardous materials in Nunavut. Copies of relevant legal documents will be kept on file at the mine site. Management and safety personnel will provide an overview of the applicable regulations to all employees as part of their orientation training and through ongoing training. The major acts, regulations, and guidelines pertinent to the hazardous products that will be used at the Doris North Project are listed below.

Federal

- Transportation of Dangerous Goods Act and Regulations (TDGA and TDGR)
- Explosives Act
- National Fire Code
- Canadian Council of Ministers for the Environment (CCME) Guidelines for Above-Ground Storage Tanks
- Used Oil and Waste Fuel Management Regulations (under revision).

Nunavut

- Consolidation of Environmental Protection Act (RSNWT 1988c E.7)
- Consolidation of the Environmental Rights Act RSNWT 1988 c83 2nd Supp)
- Transportation of Dangerous Goods Act (RSNWT 1988) and Regulations
- Explosives Use Act
- Consolidation of Explosives Regulations RRNWT 1990 c E27
- Fire Prevention Act and Regulations
- Mine Health and Safety Act and Regulations
- Work Site Hazardous Materials Information System Regulations (WHMIS).
- Consolidation of Regulation RRNWT 1990 c P-2 Pesticide Regulations (July 15, 1992)
- Environmental Guideline for General Management of Hazardous Waste
- Environmental Guideline for Waste Batteries
- Environmental Guideline for Waste Asbestos
- Environmental Guideline for Waste Antifreeze
- Environmental Guideline for Waste Solvents
- Environmental Guideline for Waste Paint
- Northwest Territories/Nunavut Mine Health and Safety Act and Regulations

The TDGA classifies hazardous materials into nine main classes according to an internationally recognized system, as follows:

- Class 1 – Explosives
- Class 1 – Gases
- Class 3 – Flammable liquids
- Class 4 – Flammable solids
- Class 5 – Oxidizing substances and organic products
- Class 6 – Poisonous (toxic) and infectious substances
- Class 8 – Corrosives

- Class 9 – Miscellaneous products or substances.

The materials addressed in this document are identified by class in the product description tables in specific sections.

1.4 Cross Reference to MHBL Plans Cited in the Hazardous Materials Management Procedures

- MHBL Emergency Response and Contingency Plan[2]
- MHBL Explosives Management Plan[3]
- MHBL Mine Closure and Reclamation Plan[4]

[2] Emergency Response and Contingency Plan, Supporting Document S10a to the Revised Water License Application Support Document, April 2007.
[3] Explosives Management Plan, Supporting Document S10f to the Revised Water License Application Support Document, April 2007.
[4] Mine Closure and Reclamation Plan, Supporting Document S10l to the Revised Water License Application Support Document, April 2007.

2.0 IDENTIFICATION, CLASSIFICATION AND STORAGE OF HAZARDOUS MATERIALS

2.1 Types of Hazardous Materials

The Doris North Project will use the following types of hazardous materials in the day to day operation of the underground mine and in the extraction of gold from the ore mined:

- Fuel and Lubricants – diesel fuel, oils, greases, anti-freeze, and solvents for power generation, building heating, equipment operation and maintenance;

- Process Plant/Milling Reagents/Consumables – Potassium Amyl Xanthate flotation collector, Aerophine 3418 Flotation Promoter, methyl isobutyl carbinol (MIBC) flotation frother, sodium cyanide for gold leaching, activated carbon for gold recovery, caustic soda (sodium hydroxide), hydrogen peroxide for effluent treatment, sulphuric acid for effluent treatment, copper sulphate for effluent treatment, sodium metabisulphite for effluent treatment, hydrochloric acid, borax, sodium nitrate, silica sand for bullion refining;

- Explosives – ammonium nitrate and pre-packaged high explosives (stick powder) used for blasting in the mine;

- Laboratory chemicals – small volumes of various chemicals in the on-site analytical laboratory to analyze rock and water samples for grade control, to monitor metallurgical performance and to monitor environmental performance.

Sections 3, 4, and 5 of these procedures contain detailed lists of product quantities and safe handling procedures for the first three categories above. Laboratory chemicals are generally very limited in quantity and will be handled only by specialist lab technicians. All waste from the analytical laboratory will be sent to the mill and eventually become part of the tailings disposal stream. As such, they are not addressed separately in this document.

All purchase orders dealing with hazardous materials must have, as condition of payment, copies of all applicable Material Safety Data Sheets (MSDSs) with the shipments in protected envelopes marked as such. This procedure will ensure that all hazardous materials shipped to the Doris North site come with written data on the recommended safe handling and storage procedures attached to each shipment. Copies of the MSDSs will be retained in a central library in the on-site mine office so that they are available to all employees.

Hazardous materials will be stored on site in permanent purpose-built designated facilities such as fuel storage tanks, explosives magazines or in steel shipping containers (Sea cans) stored within the designated mill reagent storage area. The locations of the areas on the mine site where hazardous materials will be stored are shown on Figure 2-1 (General Site Plan) and on Figure 2-2 (Mill Pad Layout).

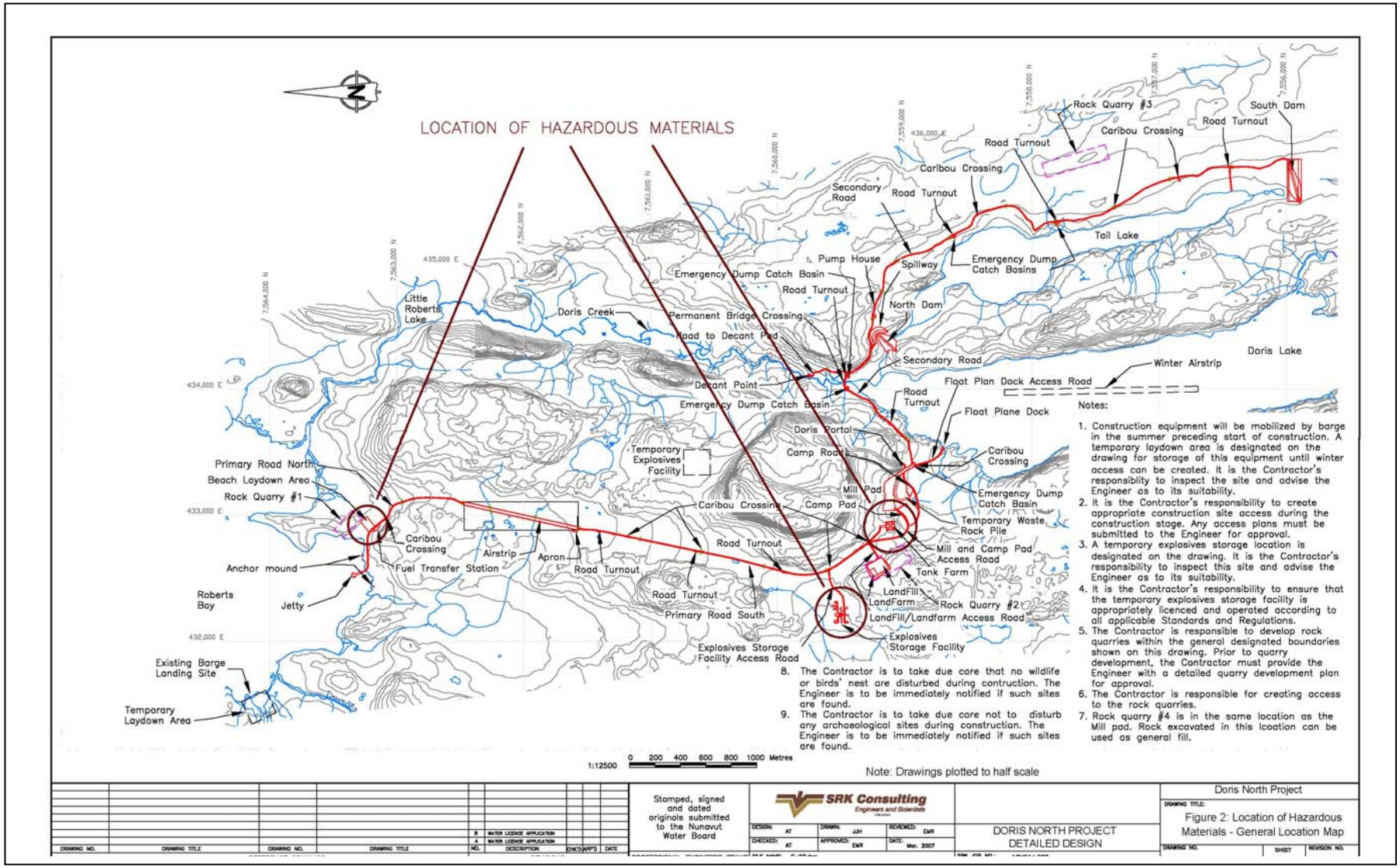
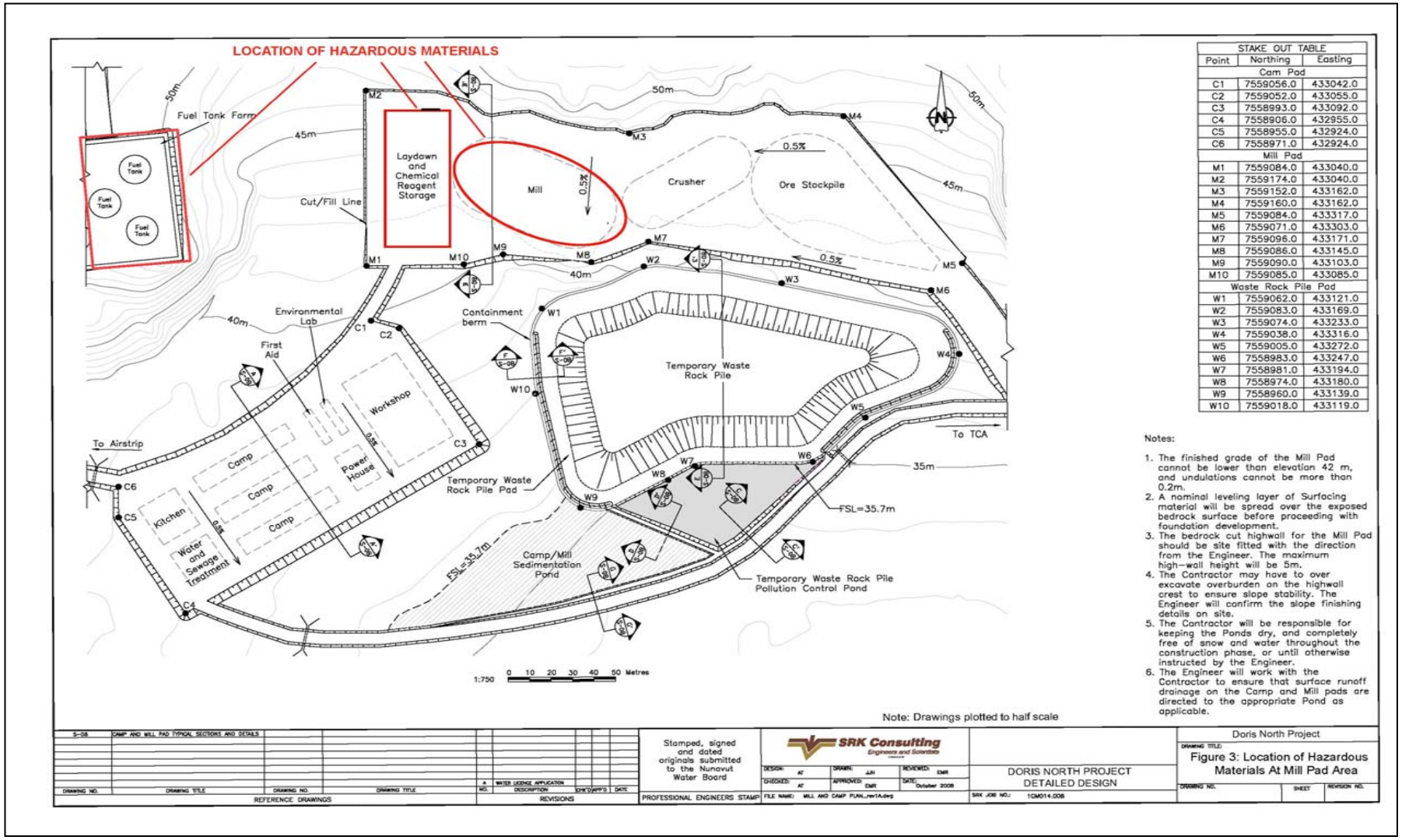


Figure 2.1 : Location of Hazardous Materials - General Location Map



STAKE OUT TABLE		
Point	Northing	Easting
Camp Pad		
C1	7559056.0	433042.0
C2	7559052.0	433055.0
C3	7558993.0	433092.0
C4	7558906.0	432955.0
C5	7558955.0	432924.0
C6	7558971.0	432924.0
Mill Pad		
M1	7559084.0	433040.0
M2	7559174.0	433040.0
M3	7559152.0	433162.0
M4	7559160.0	433162.0
M5	7559084.0	433317.0
M6	7559071.0	433303.0
M7	7559096.0	433171.0
M8	7559086.0	433145.0
M9	7559090.0	433103.0
M10	7559085.0	433085.0
Waste Rock Pile Pad		
W1	7559062.0	433121.0
W2	7559083.0	433169.0
W3	7559074.0	433233.0
W4	7559038.0	433316.0
W5	7559005.0	433272.0
W6	7558983.0	433247.0
W7	7558981.0	433194.0
W8	7558974.0	433180.0
W9	7558960.0	433139.0
W10	7559018.0	433119.0

Notes:

1. The finished grade of the Mill Pad cannot be lower than elevation 42 m, and undulations cannot be more than 0.2m.
2. A nominal leveling layer of Surfacing material will be spread over the exposed bedrock surface before proceeding with foundation development.
3. The bedrock cut highwall for the Mill Pad should be site fitted with the direction from the Engineer. The maximum high-wall height will be 5m.
4. The Contractor may have to over excavate overburden on the highwall crest to ensure slope stability. The Engineer will confirm the slope finishing details on site.
5. The Contractor will be responsible for keeping the Ponds dry, and completely free of snow and water throughout the construction phase, or until otherwise instructed by the Engineer.
6. The Engineer will work with the Contractor to ensure that surface runoff drainage on the Camp and Mill pads are directed to the appropriate Pond as applicable.

S-58 CAMP AND MILL PAD TYPICAL SECTIONS AND DETAILS
REFERENCE DRAWINGS
A WATER LICENCE APPLICATION
REVISIONS
Stamped, signed and dated originals submitted to the Nunavut Water Board
PROFESSIONAL ENGINEERS STAMP
SRK Consulting Engineers and Scientists
DESIGN: AT DRAWN: JJH REVIEWED: EMR
CHECKED: AT APPROVED: EMR DATE: October 2006
FILE NAME: MILL AND CAMP PLAN_rev1A.dwg
DORIS NORTH PROJECT
DETAILED DESIGN
SRK JOB NO.: 1CM014.006
Doris North Project
DRAWING TITLE:
Figure 3: Location of Hazardous Materials At Mill Pad Area
DRAWING NO. SHEET REVISION NO.

Figure 2.2: Location of Hazardous Materials at Mill Pad Area

Though each summer a year's supply of hazardous substances will be shipped to site, rotational inventories will be used to use older stock ahead of newer stock. The materials will be stored in an organized manner to ensure shelf lives do not expire and that minimal waste is incurred. MHBL will implement a strict inventory control system that documents items such as:

- Expiration dates;
- Quantities remaining in stock;
- Priority of usage;
- Rates of usage; and
- Projected dates for re-ordering of stock items.

All hazardous materials purchased will pass through the following waste minimization and pollution prevention scrutinizing principles:

Could the substance in question be substituted with something less toxic or non-toxic?

- If a hazardous substance is requested for usage that could be substituted with a non-hazardous substance for the same purpose, care will be taken to purchase the non-hazardous substance.

Are the correct quantities of hazardous materials being purchased?

- Quantities of materials will be reviewed on a consistent basis to ensure that adequate materials are available to run the mine but no superfluous excess is present to impose a risk due to wastage or out of date inventory.

Will the purchasing vendor accept used containers and/or excess/obsolete materials?

- Care will be taken to preferentially acquire hazardous materials from suppliers who have policies of return of used containers, and/or excess/obsolete materials. Minimization of waste is a MHBL priority and will be taken into account during the purchasing stage of any potentially hazardous material.

Hazardous materials released during transportation, handling, storage, usage, distribution and disposal have the potential to negatively affect the environment as well as the personnel using these substances. MHBL's Emergency Response and Contingency Plan[5] addresses the emergency protocols pertaining to accidental hazardous substance release into the environment at the Doris North Project site. Site personnel involved in the transportation, handling, usage, distribution and disposal of such hazardous materials will be trained in emergency response procedures.

Most of the hazardous materials used at the Doris North Project will be shipped to the Project site by barge from Hay River. The shipping company will be Northern Transportation Company Limited (NTCL). NTCL has a long track record of shipping fuel and other potentially hazardous materials by barge down the Mackenzie River and

[5] Emergency Response and Contingency Plan, Supporting Document S10a to the Revised Water License Application Document, April 2007.

throughout the Western Arctic. NTCL has in place its own emergency response and contingency measures covering accidental release of hazardous materials during shipment to the Doris North Project site[6].

2.2 Review of Hazardous Materials Management Procedures

This procedure will be reviewed by MHBL on an annual basis and revised as required to reflect all implemented and projected changes to the HMMP, to correspond with new information and latest technology. The reviewed Plan will be submitted to the NWB as a component of the annual reporting requirement of the mine's water license. In the event that a significant change occurs before this annual review, for example, if a new material is introduced to the work site, the Plan will be updated and submitted to the NWB at that time. The HMMP, as part of the overall EPP, will ensure that MHBL's environmental policies are implemented as they were envisioned and that the objectives outlined are achieved in a manner that is both timely and efficient. Specifically, the implementation of the HMMP facilitates environmental compliance to existing regulatory requirements and minimizes any potential adverse environmental impacts.

2.3 Classification of Hazardous Materials

Hazardous materials are classified in accordance to the *Transportation of Dangerous Goods Act and Regulations.* All of the substances which fall under these regulations will be labelled accordingly in order to inform personnel as to their toxicity and to comply with governmental regulations.

Material Safety Data Sheets will be available for all hazardous materials located on-site. Copies of all pertinent MSDSs for products utilized at site will be available at the First Aid Station and at each of the designated work areas where the hazardous materials are to be utilized. The Environmental and Health and Safety Coordinators will have the most updated MSDSs digitally on their computer systems available for printing. All personnel working at site, who may have to handle or encounter hazardous materials, will be required to complete the WHMIS training module.

Representative material safety data sheets (MSDSs) for Diesel Fuel, Potassium Amyl Xanthate, Aerophine 3418, isobutyl methyl carbinol (MIBC), sodium cyanide, activated carbon, caustic soda (sodium hydroxide), hydrogen peroxide, sulphuric acid, copper sulphate, sodium metabisulphite, hydrochloric acid, borax, sodium nitrate, silica sand and ammonium nitrate are provided in Appendix A.

2.4 Life Cycle Management

"Life cycle management" refers to the assessment and management of a particular product over its entire life - from the time a material need is identified to the time the product is fully consumed or disposed of as waste. It covers product supply, transportation, storage, handling, recycle, and waste disposal. MHBL is committed to ensuring proper life cycle management of all potentially hazardous materials used at the Doris North Project site. MHBL and its contractors will deal only with reputable, certified suppliers, transporters, and

[6] (http://www.ntcl.com/about_us/our_services.html)

expediters for the supply, delivery and disposal of all potentially hazardous materials to be used at the Doris North Project.

2.4.1 Delivery

All hazardous materials will be delivered to site by commercial carriers in accordance with the requirements of the Canadian Transportation of Dangerous Goods Act (TDGA). Carriers will be licensed and inspected as required by the Department of Transportation. All required permits, licenses, and certificates of compliance are the responsibility of the carrier. All shipments will be properly identified and placarded. Shipping papers must be accessible and include information describing the substance, immediate health hazards, fire and explosion risks, immediate precautions, fire-fighting information, procedures for handling leaks or spills, first aid measures, and emergency response telephone numbers.

Each transportation company will be required to have in place an updated spill prevention, control, and countermeasures plan to address the materials they are transporting for MHBL. In the event of a release during transport, the commercial transportation company is responsible for first response and cleanup.

2.4.2 On-Site Handling

Once dangerous goods are received at the workplace, additional regulations apply. The federal WHMIS calls for the proper labeling of products, the availability of product information in the form of MSDSs, and employee education on how to identify and handle hazardous products. An inventory tracking system will be established. All hazardous materials will be stored in secured areas to prevent access by unauthorized personnel or any tampering.

All tanks used for the storage of hazardous materials will be installed in secondary containment areas sized to hold at least 110% of the volume of the largest tank (see Section 3.5 for additional information on required containment). Tanks and vessels in the process plant will be installed on concrete surfaces sloping to interior sumps that will route spilled solutions to lined collection areas.

MHBL has developed an Emergency Response and Contingency Plan[7]. This Plan outlines the planned response protocols to address accidental spills or releases of potentially hazardous materials to minimize health risks and environmental effects. Included are procedures for initial response to halt and/or contain spilled material, evacuating personnel, cleanup activity, emergency contacts, internal and external notifications to regulatory authorities, and incident documentation.

2.4.3 Handling of Waste Generated from Use of Hazardous Materials

Waste generation at the Doris North Project will follow a plan consisting of reduction, recovery, reutilization, and recycling. This will result in waste being recycled wherever

[7] Emergency Response and Contingency Plan, Supporting Document S10a to the Revised Water License Application Support Document, April 2007.

possible. The use of hazardous materials at the Doris North Project will however inevitably lead to the generation of potentially hazardous waste materials.

The types and volumes of hazardous waste generated on an annual basis by the Doris North Project are estimated as follows:

- Waste engine oil from engine maintenance – estimated at between 2,500 and 5,000 litres per year – this waste oil will be used to generate heat by combusting it in a purpose build waste oil burner complete with facilities to filter out metal sludges. The sludges will be drummed and shipped off site for disposal at a licensed hazardous waste landfill. Estimated at 0.5 drum over the 2 year mine life.

- Engine oil filters – estimated at four drums per year. These will be drained, packaged and shipped off site for disposal at a hazardous waste landfill.

- Waste antifreeze – estimated at one drum per year. This will be shipped off site for disposal (recycle) through a licensed recycle facility.

- Waste Hydraulic Fluid – estimated at 5 drums per year. These will be shipped off site for disposal (recycle) through a licensed recycle facility.

- Waste Mill Lubricating oil from bearing oil changes – estimated at 2,500 litres per year. This waste oil will be used to generate heat by combusting it in a purpose build waste oil burner complete with facilities to filter out metal sludges.

- Waste Grease – estimated at 2 drums per year. These will be shipped off site for disposal through a licensed disposal facility.

- Waste Solvent from parts cleaning – estimated at 2 drums per year. These will be shipped off site for disposal (recycle) through a licensed recycle facility.

- Used vehicle Batteries – estimated at 0.5 pallets per year. These will be packed into approved containers and shipped off site for disposal (recycle) through a licensed recycle facility.

- Assay lab crucibles from fire assaying for gold – estimated volume at 4 to 5 drums per year. These will be drummed and held until the annual sealift, when they will be taken off site to a lead disposal facility. These crucibles are potentially hazardous due to the lead contamination from the lead based flux used in the fire-assay assay fusion mixture.

On becoming wastes, materials will be stored and/or disposed of in accordance with specific government regulations and guidelines. Overall, hazardous waste treatment, recycling, and disposal facilities are lacking in Nunavut. MHBL will therefore store most waste materials in secure facilities until they can be transported offsite for recycling or disposal. Hazardous wastes such as grease and lubricants, spent solvents, antifreeze, chemicals acids and used batteries will be stored in proper containers at a designated waste transfer area. These materials will be placed into sea-can containers and held (pending shipment) on the plant site rockfill pad area where any spillage can be captured in the storm water sumps and directed to the tailings containment area in the event of an

accident. This designated waste transfer site will be within the area on the mill pad that is designated as "Laydown and Chemical Reagent Storage" – see location on Figure 3.

Stored hazardous materials will be properly shipped off site during periods of opportunity, such as during the annual sealift. Shipped hazardous materials will be transported by barge to the NTCL yard in Hay River and then on by truck to approved disposal or recycling facilities for appropriate disposal in southern Canada.

Waste engine oil will be transferred into a designated storage tank and burned using a waste oil burner unit to provide heat as required to the surface maintenance shop building. The tank and waste oil burner will be located within the surface maintenance shop building. The waste oil burner will be equipped with filters to remove heavy metal sludge prior to burning. Unused explosives will be burned or destroyed on-site and unused chemicals as well as any other hazardous material will be disposed of in an appropriate manner.

2.4.4 Empty Product Containers

In the mill, all reagent containers will be washed out at the time of reagent mixing so that the washings are retained and used within the milling process. In the case of bulk bags, the washed bags will be collected in a designated garbage container and then transferred to a burning pit to be located within the site non-hazardous landfill site[8] . These bags will then be burned to ensure that the bags are not reused. Similarly the plywood shipping boxes used to contain sodium cyanide bulk bags will be burned in the burning pit within the landfill site to prevent this wood being used for other purposes. The ash from the burning of these plywood boxes will not present an environmental hazard as the burning process will convert any residual cyanide potentially transferred into the wood as carbon dioxide and nitrogen. The burn pit is well sheltered from wind and water sources and the ash will be disposed of in the landfill. This is a precautionary step (as typically this plywood has no direct contact with the cyanide pellets contained within the shipping bag) taken to ensure that there is no health and safety risk to humans or wildlife from any residual cyanide that could have contacted the plywood in the event the internal bulk shipping bag is damaged.

Plastic/metal reagent pails and drums will be similarly washed and stockpiled for off site return to the supplier where applicable. Hydrocarbon pails and drums will be allowed to gravity drain into a collecting drum and then similarly stockpiled for off-site return to the supplier where applicable. Empty reagent containers will not be disposed off in the site non-hazardous landfill site. The only exceptions will be for containers that cannot be returned to the supplier and that have been rendered non-hazardous by appropriate cleaning methods. The residual material drained from these containers will be treated and handled as hazardous waste (i.e., packaged and removed from site for appropriate recycle/disposal).

[8] Landfill Management Plan, Supporting Document S10g to the Revised Water License Application Support Document, April 2007.

3.0 FUELS & LUBRICANTS

3.1 Introduction

The proposed Doris North Project will consume relatively large amounts of petroleum fuels, oils and lubricants. These products will be shipped, stored, handled and consumed in compliance with applicable Federal and Nunavut legislation/regulations and in accordance with industry best management practices. A full year's supply of petroleum fuels (primarily diesel fuel), oils and lubricants will be shipped to site each summer during the open water shipping season via NTCL barges and then placed into storage on site. A small amount of oil and lubricants may have to be shipped to site via air transport to accommodate special needs not anticipated during the annual sealift re-supply.

The transportation, storage, and handling of diesel products are strictly regulated by both federal and territorial legislation. MHBL will ensure that all such requirements are met. MHBL will emphasize the need for regular inspection of all storage and distribution facilities on site to assure mechanical soundness and to prevent leaks or any other uncontained release of diesel fuel.

It is of note that over the next three or four years, the Canadian government will be implementing a series of regulations requiring suppliers and end-users to convert to diesel fuel containing lower levels of sulphur; the sulphur released from burning diesel fuel is a major contributor to air pollution.

3.2 Product Description

The anticipated types and quantities of petroleum fuels, oils and lubricants to be shipped, stored and used at the site during the mine's operating life are summarized in Table 3.1. The hazard classes, potential impacts, and personal protective equipment as recommended by the product suppliers in respective MSDSs are summarized in Tables 3.2 to 3.4.

Table 3.1: Fuel Products – Storage Locations

Product	Total Quantity On-Site /	Storage Location	Container
Diesel	7.5 ML	Tank farm to be located at the plant site	bulk stored in 5 x 1.5 ML steel storage tanks in a bermed and lined area
Motor Oil	~10,000 L	Laydown Area	9,000 L in barrels or bulk containers stored within shipping containers in the warehouse laydown area
		Mechanical workshop	~500 L in barrels or bulk containers stored in a silled area within the shop
		Powerhouse	~ 500 L in barrels or bulk containers stored in a silled area within the powerhouse
		Underground	~ 205 L delivered UG using a lube truck
Aviation Fuel (Jet A & B)	~5,000 L	Airstrip	~5,000 L in barrels primarily for use by helicopters in ongoing exploration stored within a shipping container
Gasoline	~ 2,000 L	Fuel Storage Tank Farm at Plant Site	Gasoline will be stored in 205 L drums within the plant fuel storage tank farm. Most site equipment will operate on diesel fuel thereby minimizing gasoline requirements.
Hydraulic Fluid	~10,000 L	Laydown Area	9,000 L in barrels or bulk containers stored within shipping containers in the warehouse laydown area
		Mechanical shop	~500 L in barrels or bulk containers stored in a silled area within the shop
		Powerhouse	~ 200 L in barrels or bulk containers stored in a silled area within the powerhouse
		Underground	~ 205 L delivered UG using a lube truck
Varsol	~2000 L	Laydown Area	1,800 L in barrels stored within shipping containers in the warehouse laydown area
		Mechanical shop	~200 L in a barrel stored in a silled area within the mechanical shop
Grease	~ equivalent of 4000 L in pails and cartridges	Laydown Area	Grease cartridges used in the mechanical shop, underground and in the mill to lubricate moving equipment – stored in warehouse until needed Pails of grease used in the mechanical shop and the underground lube service truck Pails of grease used in the mill for the crusher and grinding mills
Ethylene Glycol	~2000 L	Laydown Area Mechanical shop	~ 1,600 L in barrels and/or 20 L pails stored in shipping containers in the warehouse laydown area
		Mechanical shop	~400 L in barrels or 20 L pails stored in a bermed area in the mechanical shop

Gasoline will not be widely used at the Doris North Project. All site vehicles will be equipped with diesel fuelled engines, however there will be a requirement for a small amount of gasoline to fuel off road vehicles such as snowmobiles and all terrain vehicles (ATVs) and to power small portable generator units and small portable pumps. Consequently a small volume of gasoline will be shipped to site in drums each year and stored within the plant site fuel tank farm.

There will be no aircraft de-icing fluids used at the Doris North Project. Fixed wing aircraft traveling to the Doris North site will typically off-load, re-load and then depart, minimizing their time on site. It will be unusual for a fixed aircraft to remain at the Doris North site overnight. Consequently ground time for aircraft will be very short, air travel will only take place in suitable weather conditions and thus de-icing fluid will not be needed on site.

Table 3.2: Hazard Classes & Potential Impacts

Material	Class	Potential Impact
Diesel Fuel	3	Snow, ice, Water, vegetation & soil contamination
Motor Oil	Not regulated	Snow, ice, Water & soil contamination
Aviation Fuel	3	Snow, Ice, vegetation, water & soil contamination
Hydraulic Fluid	Not regulated	Water, snow, ice & soil contamination
Varsol	3	Soil contamination
Automotive Grease	Not regulated	Negligible risk with proper handling
Ethylene Glycol	Not regulated	Negligible risk with proper handling

Table 3.3: Fuel Products – Safe Handling Procedures

Product	Product Handling Procedures
Diesel	Do not get in eyes, on skin, or on clothing. Avoid breathing vapours, mist, fume, or dust. Do not swallow. May be aspirated into lungs. Wear protective equipment and/or garments if exposure conditions warrant. Wash thoroughly after handling. Launder contaminated clothing before reuse. Use with adequate ventilation. Keep away from heat, sparks, and flames. Store in a well-ventilated area. Store in a closed container. Bond and ground during transfer.
Motor Oil	Wear protective clothing and impervious gloves when working with used motor oils.
Jet A	See diesel
Jet B	Avoid skin contact. Launder contaminated clothing before reuse. Store in a flammable liquids area. Store away from heat, ignition sources and open flames. Jet fuel will burn vigorously and can explode with the right fuel-air mixture (between lower explosives limit and upper explosives limit).
HydraulicFluid	Keep container closed until ready for use.
Varsol	Avoid eye contact. Use with adequate ventilation. Wash thoroughly after handling. Empty container retains residue. Follow label instructions. Avoid repeated skin contact. Store in cool, ventilated area, away from ignition sources and incompatibles. Keep container tightly closed.
Automotive Grease	Minimize breathing vapour, mist, or fumes. Avoid prolonged or repeated contact with skin. Remove contaminated clothing; launder or dry-clean before re-use. Remove contaminated shoes and thoroughly clean before re-use; discard if oil-soaked. Cleanse skin thoroughly after contact, before breaks and meals, and at end of work period. Product is readily removed from skin by waterless hand cleaners followed by washing thoroughly with soap and water. To prevent fire or explosion risk from static accumulation and discharge, effectively ground product transfer system in accordance with the National Fire Code. Keep containers closed when not in use. Do not store near heat, sparks, flame, or strong oxidants.
Ethylene Glycol	Ensure adequate ventilation. Wear protective gloves and chemical safety goggles. Keep in tightly closed container, stored in a cool, dry, ventilated area. Separate from acids and oxidizing materials. Empty containers of this product retain product residues and may be hazardous.

Table 3.4: Fuel Products – Personal Protective Equipment

	Personal Protective Equipment		
Product	**Eyes**	**Skin**	**Respiration**
Diesel	Chemical goggles	Neoprene or nitrile gloves; protective garments	None usually required
Motor Oil	Chemical goggles	Neoprene or nitrile gloves; protective garments	None usually required
Aviation Fuel (Jet A and B)	Chemical goggles	Neoprene or nitrile gloves; protective garments	None usually required; ensure adequate ventilation
Hydraulic Fluid	Chemical goggles	None usually required	None usually required
Varsol	Chemical goggles	Rubber gloves	None usually required; ensure adequate ventilation
Automotive Grease	Chemical goggles	Neoprene or nitrile gloves; protective garments	None usually required; ensure adequate ventilation
Ethylene Glycol	Chemical goggles	Neoprene or nitrile gloves; protective garments	None usually required; ensure adequate ventilation

3.3 Delivery to Site

With the exception of diesel fuel, most petroleum fuel and lubricant products will be delivered to site and stored in the original packing containers as received from the manufacturer. These types of containers include a variety of sealed drums, pails, cans, and tubes.

Diesel fuel will be transported once per year to the Doris North Project in bulk via NTCL barges. Typically the barges will arrive at Roberts Bay in late summer. The barges will be brought into the proposed Doris North jetty and secured. Pumps and floating fuel hoses will be supplied by the shipping company for the purpose of fuel transfer from the incoming barges to a tank truck loading facility. The diesel fuel will be pumped from the barges to tank trucks that will be loaded within an on-shore tank truck loading facility to be constructed adjacent to the Roberts Bay laydown area.

To ensure containment of any fuel released during transfer from the barge to the fuel haul truck, the fuel transfer station will be located inside a secondary containment berm. Ramp access for the fuel truck to the fuelling station will be provided. The high density polyethylene (HDPE) liner will cover the entire inside area of the tank farm, including the inside slopes of the containment berms and the base of the sump[9].

The fuel will then be hauled by standard highway fuel truck via the all-weather access road to the 7.5 million litre fuel tank farm at the Doris North plant site. During loading and

[9] For detail on the design of this transfer facility see Design of the Surface Infrastructure Components, Supporting Document S2, Technical Specifications for Tailings Containment Area and Surface Infrastructure Components, Supporting Document S3 and Engineering Drawings for Tailings Containment Area and Surface Infrastructure Components, Supporting Document S4 (drawings S-01 and S-02) to the Revised Water License Application Support Document, April 2007.

unloading of the fuel, the fuel truck will have the right of way along the all weather road leading to the bulk storage facilities at Doris North.

The 7.5 million litre capacity fuel tank farm will be constructed within a lined containment area on a rock fill pad with appropriate berms. The tanks (5 x 1.5 million litre capacity welded steel tanks) will be erected in an engineered containment area (71 m by 71 m) consisting of a HDPE lined pad, with lined containment berms, having sufficient capacity to retain 100% of the volume of the largest single fuel tank plus 10% of cumulative volume of all additional tanks. The base of the containment area will be graded to a corner sump location that will be used to pump out storm water and snowmelt. All storm water and snowmelt will be pumped through an F1 "Flow and Plug" Oil Adsorption System (Model F11-C-180-TM-Cx2 as supplied by Terry Ruddy Sales of Edmonton Alberta) to treat all precipitation runoff collected within the bermed fuel tank area. This system consists of a self priming electric pump, a particulate filter, a drum containing TM-100 oil adsorbing media and two activated carbon media containers connected in series. The unit operates at 5 to 7 gpm and is sold with a design criteria removal of oil and grease to a level below 15 ppm as regulated by the Alberta Ministry of Environment. The unit is designed so that the TM-100 oil adsorbing media will blind off when it reaches its absorbent capacity. The treated water will be land applied onto the surrounding tundra in a manner that prevents erosion at the point of application[10]. Any fuel spills will be pumped to appropriate containers.

The regulations governing the bulk storage of fuel in aboveground storage tanks are in the process of being upgraded. The tank farm at the plant site has been designed in accordance with the principles outlined in two working documents: Environment Canada's 'Proposed Federal Petroleum Products and Allied Petroleum Products Storage Tank Systems Regulations' (Environment Canada 2003) and the Canadian Council of Ministers of the Environment's (CCME's) 'FINAL DRAFT: Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products'). While these documents are not yet in the legal standards, it is expected that all new fuel storage facilities will be required to adhere to the standards therein.

Bulk fuel storage tanks will be registered as required by the *National Fire Code* and each tank will be affixed with a clearly visible registration number plaque.

3.4 Fuel Transfer Procedures

The transfer of fuel at Doris North will follow the guidelines contained in MHBL Standard Operating Procedure – Hydrocarbon Fuel and Gas Dispensing Procedure (Appendix F). General procedures to be followed are listed below:

[10] For additional design detail see Design of the Surface Infrastructure Components, Supporting Document S2, Technical Specifications for Tailings Containment Area and Surface Infrastructure Components, Supporting Document S3 and Engineering Drawings for Tailings Containment Area and Surface Infrastructure Components, Supporting Document S4 S4 (drawings S-05 and S-06) to the Revised Water License Application Support Document, April 2007.

- Before fuel transfer is started, verify that:
  - all fuel transfer hoses have been connected properly and couplings are tight;
  - transfer hoses are not obviously damaged;
  - fuel transfer personnel are familiar with procedures;
  - personnel are located at both the fuel delivery truck and fuel transfer tank(s) and can manually shut off the flow of fuel; and
  - if a high liquid level shutoff device is installed at the delivery tank, verify that the shutoff is operating correctly each time it is used.
- Fuel transfer will then proceed.
- All accidents or spills must be reported immediately to the Surface/Maintenance Superintendent and the Environmental Coordinator. Emergency spill containment and clean up procedures should be initiated immediately.

3.5 Environmental Protection Procedures

The major concern regarding the safe handling, storage and consumption of petroleum fuels, oils and lubricants is their uncontrolled release to the environment through spillage and subsequent adverse impacts on terrestrial, aquatic, and marine habitat; impacts to wildlife and aquatic life; and ongoing protection of human health and safety. The following section outlines environmental protection procedures that apply to the use of fuel and other hazardous materials:

- All necessary precautions are to be taken to prevent and minimize the spillage, misplacement, or loss of fuels and other hazardous materials.

- Before installing any fuel storage tank, the necessary approvals in compliance with Canadian Council of Ministers of the Environment (1994) Environmental Code of Practice for Aboveground Storage Tank Systems Containing Petroleum Products will be obtained from the regulatory authorities. Verification of the storage tank approval will be retained by MHBL. Approval for constructing of dykes and lined secondary containment berms for stored petroleum products will be obtained from the KIA.

- Fuels and other hazardous materials will be handled only by persons who are trained and are competent in handling these materials in accordance with MHBL standards and operating procedures, the manufacturer's instructions and government laws and regulations. Operators will be in attendance for the duration of a refueling operation. In the event of an unexpected fuel spill into a waterways (any volume), or 25 L or more on land, the regulatory authorities will be contacted immediately at the NWT 24-Hour Spill Report Line at **(867) 920-8130** as per the MHBL Emergency Response and Contingency Plan[11]. All spills of any volume will be logged and made available to INAC inspectors upon request. A copy of the spill log will be appended to the annual report to Nunavut Water Board.

[11] Section 4.6, Emergency Response and Contingency Plan, Supporting Document S10a to the Revised Water License Application Support Document, April 2007.

- A detailed spill report will be submitted to INAC within **30** days from the date of the reported spill; a copy will be sent to the KIA, Cambridge Bay.

- All petroleum products (oils, grease, gasoline, diesel or other fuels) will be stored in secondary containment trays and at least 30 m from any water body.

- Handling and fuelling procedures will comply with MHBL Standard Maintenance Operating Procedure (Hydrocarbon Fuel and Gas Dispensing Procedure, August 2006 included as Appendix F to this Plan) in order to limit potential contamination of soil or water.

- All approved AST tanks exceeding 4,000 L in volume will be contained in a lined secondary containment berm surrounded by an impervious dyke of sufficient height as per the following guidance:

    - where a dyked area contains only one storage tank the dyked area will retain not less than 110% of the capacity of the tank; and

    - where a dyked area contains more than one storage tank, the dyked area shall retain not less than 110% of the capacity of the largest tank or 100% of the capacity of the largest tank plus 10% of the aggregate capacity of all the other tanks whichever is greater.

Otherwise approved storage tanks with internal secondary containment will be used.

- Any dykes of earthwork construction will have a flat top not less than 0.6 m wide, and be constructed and maintained with a low permeability liner system (such as HDPE). The distance between a storage tank shell and the centre line of a dyke will be at least one half the tank height.

- Fuel storage areas and non-portable transfer lines will be clearly marked or barricaded to ensure that they are not damaged by moving vehicles. The signs will be visible under all weather conditions following the Canadian WHMIS reference guide.

- Waste oils will be disposed of by incineration in a dedicated waste oil burner unit located in the surface maintenance shop. Other contaminated petroleum products such as diesel fuel and Jet B will be recovered. If sufficient volume exists, diesel or other low-volatile fuels will be used as fuel source for heating purposes; aviation fuel and gasoline will be incinerated in a safe manner as they are not suitable for normal heating purposes.

- All storage tank systems will be inspected on a regular basis (minimum of once per week) using a check list. This involves, but is not limited to, gauging or dipping and the keeping of reconciliation records for the duration of the mine life.

- Any contracted company used to transport or transfer fuel to the Doris North Project will, before transporting or positioning fuel to the site be required to have on file at the MHBL office a copy of their "Fuel and Hazardous Material Spill Contingency Plan".

- Smoking is prohibited at all fuel storage areas and during transporting and dispensing activities.

- Temporary fuelling or servicing of mobile equipment in areas other then the main fuel storage site is not allowed within 30 m of a watercourse.

- Soil contaminated with diesel fuel is to be removed and placed in the on-site Landfarm facility[12] for natural remediation process to take place.

- Any soil contaminated by small leaks of any petroleum products from equipment will be treated in accordance with the procedures outlined in the MHBL Emergency Response and Contingency Plan[13] .

- Bulk fuel storage facilities will be dipped on a weekly basis in order to accurately gauge fuel consumption. These consumption rates will allow for visually undetectable sources of contamination to be identified and corrected. In an event where bulk AST tanks are used for daily activities, they will be dipped on a daily bases.

3.6 Landfarm

Soils contaminated by hydrocarbons from spills will be salvaged and deposited within a landfarm cell for bioremediation[14]. The landfarm will be approximately 50 x 25 m in size and no more than 1 m deep to ensure the soils are kept within the thermally active zone. The cell will be confined within a berm and underlain by a low permeability HDPE geomembrane covered with a thin bedding layer (0.3 m) of fine crushed rock (surfacing material) to protect the liner. The contaminated soils will be placed and spread during summer months for remediation through natural microbiological and evaporative processes. Soil that has reached acceptable levels of hydrocarbon degradation will be removed and used as growth media in areas where progressive reclamation is underway (such as to remediate ground disturbed in areas no longer in use such as in the quarries or in closed out cells within the landfill[15].

[12] Operation of the landfarm is presented in the Landfarm Management Plan, Supporting Document S10h to the Revised Water License Application Support Document, April 2007.
[13] Emergency Response and Contingency Plan, Supporting Document S10a to the Revised Water License Application Support Document, April 2007.
[14] Landfarm Management Plan, Supporting Document S10h to the Revised Water License Application Support Document, April 2007.
[15] Design details for the landfarm and landfill in Design of the Surface Infrastructure Components, Supporting Document S2, Technical Specifications for Tailings Containment Area and Surface Infrastructure Components, Supporting Document S3 and Engineering Drawings for Tailings Containment Area and Surface Infrastructure Components, Supporting Document S4 (drawings S-05 and S-06) to the Revised Water License Application Support Document, April 2007

The landfarm will be operated in accordance with Nunavut government guidelines. The Environmental Protection Service of the Nunavut Department of Sustainable Development has published an "Environmental Guideline for Soil Remediation" that provides guidance as to acceptable levels for the remediation of hydrocarbon contaminated soils in Nunavut. These guidelines are derived from the CCME 1991 Interim Criteria and the CCME 1997 Recommended Soil Quality Guidelines. MHBL will use the industrial remediation guideline[16] to determine when soil has been remediated to a level acceptable for removal from the landfarm facility for use in site remediation.

The soil will be turned regularly to provide aeration and promote the remediation process. Inspections and sampling will be done to assess the effectiveness of the landfarm treatment. This work will be undertaken under the supervision of the on-site Environmental Coordinator. If it becomes evident that effective remediation is still not achievable, MHBL will remove hydrocarbon contaminated soil and place it underground within a mined out portion of the mine where it will become encapsulated in the frozen ground once the mine is closed.

All storm water and snowmelt collected within the bermed landfarm area will be pumped through an F1 "Flow and Plug" Oil Adsorption System[17] (Model F11-C-180-TM-Cx2 as supplied by Terry Ruddy Sales of Edmonton Alberta). The treated water will be land applied onto the surrounding tundra in a manner that prevents erosion at the point of application.

3.7 Used Petroleum Products

Used oil is a hazardous waste. MHBL intends to incinerate used petroleum waste products (such as diesel fuel and light engine oils) on site in a purpose built waste oil burner unit to be installed at the surface mechanical shop to provide building heat. MHBL also intends to use some waste fuel oil as an accelerant in the camp incinerator.

All used petroleum products (waste oils) will be collected in drums and then transferred into a self-contained "Waste Oil" tank to be located in the surface maintenance shop.. Waste hydrocarbon products that are not suitable for burning in the waste oil burner system will be separated and placed in labelled drums and then stored in a Sea Can container located within the mill pad "Laydown and Chemical Reagent Storage Area" pending off site shipment during the annual sea lift. These will then be shipped by barge to the NTCL facility in Hay River and then shipped by truck to an appropriate waste oil refining or collection facility in Alberta for recycling where possible or disposal where not possible. Empty petroleum containers will be stored on site in a designated area and returned to the supplier on backhauls during the annual sealift re-supply.

[16] Table 2.1, Landfarm Management Plan, Supporting Document S10h to the Revised Water License Application Support Document, April 2007.
[17] Appendix B, Landfarm Management Plan, Supporting Document S10h to the Revised Water License Application Support Document, April 2007.

3.8 Fuel Inventory at Final Mine Closure

On closure of the underground mine and surface facilities, some storage capacity will be left in place at site for diesel fuel for the use of personnel involved in close-out and reclamation activities. Small amounts of other petroleum products will also continue to be available. More details are provided in the Mine Closure and Reclamation Plan.[18]

[18] Section 6.1.5.7, Mine Closure and Reclamation Plan, Supporting Document S10l to the Revised Water License Application Support Document, April 2007.

4.0 EXPLOSIVES

Explosives management is detailed in the Explosives Management Plan for the Doris North Project[19]. A summary is provided in this section; however, the reader is referred to the Explosives Management Plan for further details.

Doris North will be an underground mine and the quantity of explosives on hand and used on an annual basis will be relatively small (approximately 700 tonnes of ammonium nitrate manufactured into ANFO on site, and 38 tonnes of packaged high explosives). All explosives (and other bulk supplies) will be delivered annually by the NTCL barge in the annual sealift from Hay River to Roberts Bay.

The explosive material categories, site handling and storage requirements, and personal protective equipment as recommended by the product manufacturers' MSDSs are summarized in Tables 4.1 through 4.3.

Table 4.1: Hazard Classes and Potential Impacts

Material	Class	Potential Impact
Ammonium Nitrate	5.1	Water contamination
High Explosives Detonators	1	Negligible with proper handling
Blasting Caps	1	Negligible with proper handling

Table 4.2: On-Hand Quantities & Safe Handling Procedures

Product	Approximate On-Hand Quantities	Handling Procedure
Ammonium Nitrate	700 tonnes packaged in 1-tonne tote bags	Avoid eye and skin contact; avoid breathing dust. Do not swallow. Separate from all organic materials or other possible contaminants that are not compatible. Store in well-ventilated location, away from all sources of heat, fire, or explosion.
High Explosive Detonators	38 tonnes as stick powder	Store under dry conditions in a well-ventilated magazine. Keep away from heat, sparks, and flames. Keep containers closed.
Blasting Caps	To be determined	Store in a cool, well-ventilated area in an approved magazine.

[19] Explosives Management Plan, Supporting Document S10f to the Revised Water License Application Support Document, April 2007.

Table 4.3: Personal Protective Equipment

Product	Eyes	Skin	Respiration
Ammonium Nitrate	Safety glasses or goggles	Non-absorbent rubber or equivalent gloves	NIOSH/MSHA approved respirator, if required
High Explosive Detonators	Safety glasses or goggles	Rubber gloves and protective clothing made from cotton	NIOSH/MSHA approved respirator
Blasting Caps	Safety glasses or goggles	Rubber gloves and protective clothing made from cotton	NIOSH/MSHA approved respirator

Explosives will be used at Doris North for blasting of the underground mine development headings and for production stope blasts. Explosives will also be used during the construction phase of mining to extract broken rock from the four quarry sites for construction of the site facilities (roads, airstrip, building pads, jetty, tailings dams, etc.).

Explosives required for construction will be shipped to the mine site during the 2007 sea lift to supplement the small volume of explosives already on-site. During the 2008 winter construction explosives will be stored on a spur winter road between the barge landing and the mine (see Figure 2); once a permanent storage area is constructed (before summer of 2008), all explosives will be moved from the temporary site to the permanent explosives storage site. The permanent explosives storage site will consist of dedicated magazines of approved construction for the separate storage of ammonium nitrate prills, high energy explosives and blasting caps (Figure 2).

Manufacture of ANFO will be contracted out by the mine to a qualified blasting contractor who will mix ammonium nitrate and fuel oil in a contractor-supplied mixing building and deliver the ANFO underground in 25 kg bags for use by certified mine personnel in mine development.

Only qualified mine employees and contractor personnel will handle explosives. Use of explosives will comply with all governing regulations.

Any spills of explosives will be cleaned up immediately, logged, and reported on the Nunavut/NWT spill line and the INAC inspector (referenced above).

On closure, all unused explosives will be burned or removed from site.

5.0 PROCESS PLANT REAGENTS & CONSUMABLES

5.1 Product Description

The process plant will use a number of chemicals and reagents to treat the ore and recover the entrained gold. The release or spill of any of these substances could possibly result in adverse environmental impacts and pose a potentially hazardous situation for those personnel exposed to these materials. Safe storage, handling, transportation, and use of hazardous materials will be coordinated through standardized operating procedures, and the application of all legislation related to hazardous wastes. These measures will ensure that the safety and environmental responsibility will be maintained with respect to these chemicals at all times during the Doris North Project life.

Material categories, site handling and storage requirements, and personal protective equipment recommended by manufacturers in MSDSs (Appendix A) are summarized in Tables 5.1 to 5.4.

Table 5.1: Process Plant Reagents – Use, Consumption & Storage

Reagent	Use	Approximate Consumption Daily	Approximate Consumption Annual	Solid/ Liquid	Normal Delivery Format	On-Site Storage*
Steel Grinding Balls	Grinding Circuit	718 Kg	262 t	solid	200 L drums	Pallet
Potassium Amyl Xanthate (PAX)	Flotation Circuit - collector	58 kg	21 t	solid	1 tonne supersacs or 200L drums	Pallet
3418 Promoter	Flotation Circuit - promoter	11 Kg	4 t	solid	1 tonne supersacs or 200L drum	Pallet
MIBC Frothing Agent	Flotation Circuit - frother	58 Kg	21 t	liquid	200 L drums	Pallet
Sodium cyanide (NaCN)	Leaching Circuit	658 kg	240 t	solid	1 tonne supersacs inside plywood boxes	Pallet
Sodium hydroxide (caustic soda) (NaOH)	Refining/	11 kg	4 t	solid	25 kg bags	Pallet
Activated Carbon	for recovery of dissolved gold from CN leach solution	250 kg	91 t	solid	500 kg supersacs	Pallet
Borax	Dore Bullion Refining	5 Kg	2 t	solid	25 Kg bags	Pallet
Sodium Nitrate	Dore Bullion Refining	5 Kg	2 t	solid	25 Kg bags	Pallet
Silica Sand	Dore Bullion Refining	5 Kg	2 t	solid	25 Kg bags	Pallet
Hydrochloric acid (HCl)	Refining	3 kg	1 t	liquid	20 gal drums	Pallet
Hydrogen Peroxide (H_2O_2)	CN destruction	323 kg	118 t	solid	200 L drums or 1000 L palletized tanks (50% strength)	Pallet
Sodium Metabisulphite	CN destruction – backup to peroxide	600 Kg	219 t	solid	1,000 kg supersacs	Pallet
Copper sulphate ($CuSO_4$)	CN destruction	68 kg	25 t	solid	25 kg bags	Pallet
Sulphuric Acid (H_2SO_4)	CN destruction	2,512 Kg	917 t	liquid	200 L drums (37% strength)	Pallet

All palletized reagents will be shipped to the Doris North Project site in seagoing containers. The reagents will be retained within these containers on their shipping pallets. The containers will be placed in the plant site reagent laydown area and material withdrawn on a pallet by pallet basis as it is needed within the plant.

Table 5.2: Process Plant Reagents – Hazard Classes & Potential Impacts

Material	Class	Potential Impact
Steel Grinding Balls	Not regulated – not a hazardous material for shipping	Negligible with proper handling
Potassium Amyl Xanthate (PAX)	Not regulated	Negligible with proper handling
3418 Promoter	Not regulated	Negligible with proper handling
MIBC Frothing Agent (Methyl Isobutyl Carbimol)	3.3 UN No. 2282. Packing Group III	Negligible with proper handling
Sodium Cyanide (NaCN)	6.1	Water contamination, can kill if swallowed
Activated Carbon	Avoid contact with strong oxidizers	Negligible with proper handling
Sodium Hydroxide (caustic soda) (NaOH)	8	Negligible with proper handling
Borax	Not regulated – non-hazardous for air, sea and road freight	Negligible with proper handling
Sodium Nitrate	5.1, UN No. 1498, Packing Group III	Negligible with proper handling
Silica Sand	Not regulated – not a hazardous material for shipping	Negligible with proper handling
Hydrochloric Acid (HCl)	8	Negligible with proper handling, chemical burns, can kill if swallowed
Hydrogen Peroxide (H_2O_2)	5.1 (Oxidizer)	Negligible with proper handling
Sodium Metabisulphite	Not regulated – not a hazardous material for shipping)	Negligible with proper handling, chemical burns, slightly hazardous in case of skin contact
Copper Sulphate ($CuSO_4$)	9	Negligible with proper handling
Sulphuric Acid (H_2SO_4)	8	Water contamination, chemical burns, can kill if swallowed

Table 5.3: Process Plant Reagents – Safe Handling Procedures

Product	Handling Procedure
Potassium Amyl Xanthate	Store in a cool well ventilated area away from ignition sources. Store in closed container. Protect from moisture and oxidants. Empty containers retain product residues and may be hazardous. Keep out of water and sewers. Do not get in eyes, on skin, or on clothing. Do not breathe vapours, mist, fume or dust.
3418 Promoter	Store in closed container in a relatively dry area. Use in a well ventilated area. Avoid contact with eyes and skin.
MIBC Frothing Agent	Stable, flammable. Incompatible with oxidizing agents, acids, acid chlorides. Store in a cool, dry place in sealed containers. Respiratory, skin and eye irritant. Keep away from sources of ignition.
Sodium Cyanide	Highly toxic, corrosive to eyes, skin, and respiratory tract. Can be fatal if swallowed, inhaled, or absorbed through skin. Keep cyanide antidote kit available in any cyanide work area. Wear personal protective clothing at all times. Keep in tightly closed container in cool, dry, ventilated area. Protect against physical damage to containers. Do not store under sprinkler systems. Do not wash out container and use for other purposes. Empty containers retain product residues and may be hazardous.
Activated Carbon	Store in a dry, well ventilated place away from incompatible materials, Wet carbon will adsorb oxygen and may reduce oxygen levels in confined spaces to dangerous levels. Adequate ventilation and precautions should be employed whenever closed tanks, receptacles or other enclosed spaces containing carbon are accessed. Suspensions of dust should be avoided and exposures of suspensions of dust to sources of ignition should be avoided.
Caustic Soda	Can cause severe injury to eyes, skin, and respiratory tract. Use personal protective equipment at all times and DO NOT contact product directly. Wash thoroughly after handling. Store in dry, well-ventilated area. Keep in original container, tightly closed. Empty containers retain product residues and may be hazardous.
Borax	Stable. Reacts violently with potassium, acid anhydrites. Incompatible with strong acids, metallic salts. Eye and skin irritant. Harmful by ingestion. Store in a dry place.
Sodium Nitrate	Stable, strong oxidizer – may ignite flammable material. Incompatible with cyanides, combustible material, strong reducing agents – aluminum. Skin, eye and respiratory irritant. Store in a dry place.
Silica Sand (quartz)	Handle in accordance with good industrial hygiene and safety practices. Do not breathe dust. Avoid breakage of bagged material to avoid releasing silica dust into the air. Quartz is incompatible with oxidizers such as hydrofluoric acid, fluorine, chlorine trifluoride, or oxygen difluoride.
Hydrochloric Acid	Do not get in eyes, on skin, or on clothing. Wear protective clothing. Avoid breathing vapours or fumes. Store in cool, dry ventilated area with acid-resistant floors. Keep container closed, out of direct sunlight, and away from heat, water, and incompatible materials. When diluting, add acid slowly to water and in small amounts. Never use hot water and never add water to acid. When opening metal drum, use non-sparking tools because hydrogen gas may be present. Do not wash out container and use for other purposes. Empty containers retain product residues and may be hazardous.

Product	Handling Procedure
Hydrogen Peroxide	Clear, colourless, odorless liquid, oxidizer, contact with combustibles may cause fire, decomposes yielding oxygen that supports combustion of organic materials, corrosive to eyes, throat, lungs and gastrointestinal tract. Store containers in cool areas out of direct sunlight and away from combustibles. Hydrogen peroxide should be stored in well ventilated areas and only transferred using appropriate procedures and passivated equipment. Contamination of stored product may cause decomposition and generation of oxygen gas which could result in high pressures and possible container rupture. Spilled product quickly decomposes to produce oxygen and water.
Sodium Metabisulphite	Keep locked up. Do not ingest. Do not breathe dust. Avoid contact with skin. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested seek medical advice immediately and show the container or label. Keep away from incompatibles such as oxidizing agents, acids. Keep container tightly closed. Keep container in a cool, well ventilated area. Moisture sensitive. Air sensitive.
Copper Sulphate	Avoid contact with skin and eyes. DO NOT breathe dust. Always wash hands thoroughly after contact. Store and use only in dry, well-ventilated areas. Keep container tightly closed.
Sulphuric Acid	Store in a well ventilated, cool, dry area. Keep dry reacts with water, may lead to drum rupture. Keep containers securely sealed. Keep away from strong bases. Not to be loaded with Class 1, 4.3, 5.1, 5.2, 6, 7, and foodstuffs. Should not be transported or stored near cyanide. Corrosive to most metals in presence of moisture, liberating hydrogen gas, (potential explosion). Reacts violently or explosively with a wide range of organic and inorganic chemicals, including water, alcohol, carbides, chlorates, picrates, nitrates, metals and other combustibles.

Table 5.4: Process Plant Reagents – Personal Protective Equipment

Product	Eyes	Protective Skin	Equipment Respiration
Potassium Amyl Xanthate	Use safety glasses with side shields	No special garments required. Avoid unnecessary skin contamination. Use impervious rubber gloves	Not generally required unless needed to prevent respiratory irritation. Use adequate ventilation to control exposure below recommended levels
3418 Promoter	Prevent eye and skin contact. For splash protection use chemical goggles or full face shield. Provide eye wash fountain	Prevent contamination of skin or clothing. Use Rubber or neoprene gloves; impervious apron or coveralls and boots	Dust mask
MIBC Frothing Agent	Safety Glasses with side shields	Prevent contamination of skin or clothing. Use Rubber or neoprene gloves; impervious apron or coveralls and boots	None Required
Activated Carbon	Prevent eye contact. For splash protection use chemical goggles. Provide eye wash	Use Rubber or neoprene gloves;.	NIOSH/MSA approved nuisance dust mask

Product	Eyes	Protective Skin	Equipment Respiration
	fountain		
Sodium Cyanide	For dust and splash protection use chemical goggles or full face shield	Rubber or neoprene gloves; impervious lab coat, apron, or coveralls and boots	NIOSH/MSHA approved respirator, if required
Sodium Hydroxide (Caustic Soda)	Tight-fitting goggles if dust is generated. For splash protection use chemical goggles or full face shield	Gauntlet type rubber or neoprene gloves; impervious apron or coveralls and boots	NIOSH/MSHA approved respirator
Borax	Safety glasses with side shields	None required	None required, recommend use only with adequate ventilation
Sodium Nitrate	Safety glasses with side shields	None required	None required, recommend use only with adequate ventilation
Silica Sand	Safety glasses, goggles or face shield (as appropriate) under circumstances where particles could cause injury to eyes	None required – use good hygiene practices	Use a NIOSH approved air purifying or supplied air respirator where airborne concentrations of crystalline silica (quartz) are expected to exceed exposure limits (10 ppm)
Hydrochloric Acid	For splash protection use chemical goggles or full face shield	Rubber or neoprene gloves; impervious apron or coveralls and boots	NIOSH/MSHA approved respirator
Hydrogen Peroxide	Use chemical splash type monogoggles and a full face shield made of polycarbonate.	For hand protection, wear approved gloves made of nitrile, PVC or neoprene. Do Not Use cotton, wool or leather for these materials react rapidly with higher concentrations of hydrogen peroxide Wear impervious clothing and boots such as protective splash suit made of SBR rubber, PVC (PVC outer shell w/polyester substrate)	If concentrations in excess of 10 ppm are expected, use NIOSH/DHHS approved self contained respirator. Do not use air purifying respirator of filtering face piece, especially those containing oxidizable sorbents such as activated carbon

Product	Eyes	Protective Skin	Equipment Respiration
Sodium Metabisulphite	Chemical goggles or full face shield	Rubber or neoprene gloves; impervious apron or coveralls and boots	Dust mask; NIOSH/MSHA approved respirator, if required
Copper Sulphate	Chemical goggles or full face shield	Rubber or neoprene gloves; impervious apron or coveralls and boots	Dust mask; NIOSH/MSHA approved respirator, if required
Sulphuric Acid	Safety glasses, goggles and face shield recommended as appropriate	Overalls or similar protective apparel, rubber boots, elbow length PVC gloves, splash apron. Wash contaminated clothing and protective equipment before storing. Avoid all contact	Combination particulate/gas respirator, Class B (Inorganic vapour). Self contained breathing apparatus may be needed for prolonged periods of exposure.

5.2 Design and Location of Storage Facilities

All milling reagents will be shipped to the Doris North Project in their original packaging as received from the suppliers. The packaging will be labeled in accordance with applicable Federal legislation/regulation (TDG and WHMIS, etc). These labels are to remain intact as the material is stored and used at the Project site.

The mill reagent mixing and storage tanks within the plant will be of the appropriate design and material to safely contain and identify the hazardous materials. Gases, such as propane, acetylene and oxygen will be provided in cylinders and stored as per National Fire Code of Canada requirements.

5.3 Inspection and Monitoring

Quantities of all hazardous chemicals transported to the on-site storage facilities via the annual sea lift will be inventoried upon receipt. The daily usage will be reconciled to inventory. Adequate quantities of appropriate types of spill and fire clean-up materials and equipment will be made available for the hazardous materials on-site. These materials and equipment include, but are not restricted to:

- fire extinguishers;
- acid neutralizing materials;
- inert absorbent materials;
- dust mitigating materials;
- masks and appropriate respiratory filters; and
- protective clothing, gloves, and safety eyewear.

Any release of hazardous materials will be reported immediately and appropriate measures will be taken to remediate the situation. The same rules will apply to all contractor

personnel. Details of reporting protocol, procedures, and remedial measures are specified in the Emergency Response and Contingency Plan[20] .

5.4 Training of Personnel

All MHBL employees will be trained in WHMIS procedures as part of their new employee orientation training. Similarly contractors will be responsible for the training of personnel in WHMIS prior to working on-site. Selected MHBL personnel, as part of the Emergency Response Team, will be trained in the following fields, regardless of previous training and experience: transporting, handling, and transferring petroleum products; emergency response; and WHMIS.

5.5 Sodium Cyanide

5.5.1 Physical Properties

Cyanide solutions have been used in the mining industry to aid in the recovery of precious metals since the late 18th century. Their use permits effective processing of lower grade ores and those not amenable to treatment through simple physical processes such as crushing and gravity separation. Although the mining industry has spent many millions of dollars over many years pursuing alternatives to cyanide, at present there is no substitute for it that is more effective, safer, easier to use, and less costly. Mining uses about 20% of total cyanide production worldwide.

Fear of cyanide arises from several historical sources and incidents. If used improperly, cyanide is toxic to humans and the environment. Humans can be exposed to cyanide by inhalation, ingestion, or absorption through the skin. However, this is also true for many other chemicals such as gasoline and common household cleaning products like bleach, which contains chlorine, a chemical as toxic as cyanide. It should be noted that the number of recorded mishaps related to cyanide use in mining is very low compared to environmental disasters caused by nature, other chemicals, and other industries.

Cyanide is a naturally occurring molecule of carbon and nitrogen. Low concentrations of cyanide are present in many insects and plants, including a wide range of vegetables, fruits, and nuts, where it provides protection against predators. It is also present in the everyday environment to which many people are exposed, for example, in road salt and automobile exhaust - not to mention tobacco smoke. The most toxic form of cyanide is HCN (hydrogen cyanide) gas.

Cyanide is one of only a few chemical reagents that will dissolve in water. Gold mining operations use very dilute solutions of sodium cyanide, typically in the range of 0.01% to 0.05% cyanide (100 to 500 ppm). Unlike many synthetic chemicals, cyanide oxidizes and decomposes when exposed to air or other oxidants, and does not persist in the

[20] Emergency Response and Contingency Plan, Supporting Document S10a to the Revised Water License Application Support Document, April 2007.

environment. As such, it does not give rise to chronic health or environmental problems when present in low concentrations.
For more information on cyanide, see the MSDSs in Appendix A for sodium cyanide and the summarized handling procedures in Appendix D.

5.5.2 Production & Handling

Cyanide production and handling are highly regulated, and its risk management is well documented. Responsible companies in both the chemical industry and the mining industry employ stringent risk management systems to prevent injury or damage from the use of cyanide. All companies and individuals in contact with cyanide must take responsibility for its safe use.

There are three primary producers of cyanide in the world: Dupont, in the United States; Degussa (now operating in Canada as CyPlus Canada) in Germany; and ICI, in England. These producers understand their responsibility for their products and sell them only to companies that have the ability and commitment to protect workers, the public, and the environment. Sodium cyanide for use in mining is generally produced as solid, white briquettes about 10 cm square. The briquettes are maintained under controlled temperature and moisture conditions, and are packaged in labelled, sealed containers to protect the briquettes from both crushing and moisture. Cyanide producers audit purchasers and transportation systems. They design special packaging for the transport of cyanide and inventory all shipments against delivery records to ensure proper surveillance at all times. All shipments are accompanied by MSDSs that provide the chemistry and toxicity of sodium cyanide, instructions in case of accidents, and emergency telephone numbers for assistance.

Truck, rail, and barge transporters screen their employees, carefully inventory packages, and establish and maintain systems for loading and unloading cyanide products. Product handling and transportation are in accordance with protocols set by the industries and in compliance with national and international regulations.

Mining companies establish inventory control systems, maintain worker training and industrial hygiene programs, and build and maintain process solution and waste management systems specifically designed to mitigate and prevent exposure to cyanide. Cyanide is stored in secure areas that are kept cool, dry, dark, and ventilated. After gold removal from the process solution, cyanide waste products are collected and recycled or destroyed. Empty containers are washed, and the rinse water is used in the gold recovery plant or processed through the tailings treatment system before discharge under controlled and permitted conditions.

At the Doris North Project site, cyanide safety procedures will include instructions for chemical storage, containment, piping, transportation, handling, use, protective equipment, personal hygiene, monitoring, and emergency contingencies. All personnel potentially exposed to cyanide, including contractors and visitors, will receive appropriate training (see Section 8).

5.5.3 International Cyanide Management Code

MHBL is committed to becoming a signatory to the International Cyanide Management Code (the Code) for the manufacture transport and use of cyanide in the production of gold. The Code is administered by a non-profit institute consisting of participants from the gold mining industry, governments, non-governmental organizations, labour, cyanide producers, and other interested parties.

The Code represents a voluntary commitment on the part of all signatories to identify and follow basic principles and guidelines for safe cyanide use at gold mining operations. This is the first such generic international code in the history of the mining industry. Under the Code, gold mines are required to manage their cyanide from source to site, thus assuming “cradle to grave” responsibility for all cyanide used at their operation. A copy of the Code is provided in Appendix B.

MHBL will follow the protocols and procedures as described in the document “Cyanide Spills Prevention and Response” prepared for the industry by T. I. Mudder, (see Appendix C). This document presents protocols and procedures for preventing and if needed responding to releases into the environment of cyanide containing solutions at mining sites similar to the proposed Doris North Project site.

6.0 TRANSPORTATION OF HAZARDOUS MATERIALS

Delivery of hazardous materials to the Doris North Project site will be conducted by annual sealift. The close proximity of the project site to the ocean (approximately 5 km) makes this is the most economic method of transporting the large amounts of hazardous material (such as fuel, ammonium nitrate, and milling reagents) required to both develop and operate the Doris North Project. Hazardous materials will be moved by barge to the proposed Roberts Bay jetty site.

The following environmental protection procedures will be followed to minimize the potential for vessels to collide, run aground, and/or sink consequently causing accidental release of fuel and other hazardous materials to the marine environment:

a) The contracting company (NTCL) providing transportation of hazardous goods services for MHBL will be responsible to ensure that the barge(s) assigned to this task comply with all regulatory requirements;

b) The delivery of hazardous materials will comply with the Canadian Transportation of Dangerous Goods Code;

c) Project vessel masters will observe the following basic rules:

   i. all Project vessels will be required to acknowledge receipt of and maintain on hand procedures and provide support information to MHBL personnel tasked with managing shipping logistics to the Project site by fax or cable before leaving port of origin;
   ii. all Project vessels will be required to advise the MHBL personnel tasked with managing shipping logistics of their time of departure from their port of origin and their estimated time of arrival at Roberts Bay, Nunavut; and
   iii. Project vessels will be required to notify the MHBL personnel tasked with managing shipping logistics of their progress at sea or, if stopping at other ports enroute, and are required to update their ETA.

d) All crew members will be required to be familiar with emergency procedures; and

e) The tug captain or his designate will make an exploratory trip to the Roberts Bay jetty each year prior to bringing in the delivery barges and tug to sound the approach route and depth of water adjacent to the jetty prior to bringing in the loaded barges.

f) MHBL personnel working with NTCL personnel will off load the barges including the potentially hazardous materials to a designated laydown area adjacent to the jetty site at Roberts Bay.

Hazardous materials will then be trucked by MHBL personnel from the Roberts Bay lay-down area overland to the Doris North Project site via an all-weather road to be constructed between Roberts Bay and the Project site. The all weather road will make it possible to transport fuel (the largest consumable item) directly from arriving barges to a fuel storage facility located at the plant site.

7.0 INVENTORY, INSPECTION & RECORDS

7.1 Fuels and Lubricants

7.1.1 Inventory Management

Diesel fuel use will be metered automatically when it is pumped from the bulk fuel storage tanks at the plant fuel tank farm. The metered volumes will be summarized weekly and reconciled against tank levels determined manually with a dipstick from the top of the tanks. Diesel fuel consumption for the power generators will be recorded weekly.

Lubricants and other petroleum products will be inventoried monthly.

7.1.2 Inspection

MHBL will inspect all fuel and lubricant storage areas on a scheduled basis. In addition to the weekly operational inspections described in Section 3.5, MHBL management personnel will conduct periodic inspections as summarized in Table 7.1. All inspections will be logged with the date and time of inspection, facility inspected, and name of the person making the inspection.

Table 7.1: Periodic Inspections of Petroleum & Other Hazardous Materials Storage Sites

Fuel Tank Farm		Annually by Mine General Manager, quarterly by Environmental Coordinator, monthly by Surface/Maintenance Superintendent, weekly by Supply personnel and daily by surface maintenance personnel.
	Procedure	Report and repair and defects noted report promptly. Written inspections reports will be filed with the Surface/Maintenance Superintendent. Copies of the follow-up actions to be made available to the Environmental Coordinator for internal auditing purposes when required.
Diesel Generating Plant		Annually by Mine General Manager, quarterly by Environmental Coordinator, monthly by Surface/Maintenance Superintendent, weekly by Supply personnel and daily by surface maintenance personnel
	Procedure	Inspections will be reported and filed as above.
Other Fuelling Stations Schedule		Annually by Mine General Manager, quarterly by Environmental Coordinator, monthly by Surface/Maintenance Superintendent, weekly by Supply personnel and daily by surface maintenance personnel
	Procedure	Inspections will be reported and filed as above.
Spill Kits Schedule		Annually by Mine General Manager, quarterly by Environmental Coordinator, monthly by Surface/Maintenance Superintendent, weekly by Supply personnel.
	Procedure	Inspections will be reported and filed as above.
Other Hazardous Material Storage Schedule		Annually by Mine General Manager, quarterly by Environmental Coordinator, monthly by Surface/Maintenance & Mill Superintendents, weekly by Supply personnel and daily by surface/mill maintenance personnel
	Procedure	Inspections will be reported and filed as above.

Any accidental damage to containment structures will be inspected immediately and appropriate repairs undertaken. The extent of damage will be reported in writing to the Mine General Manager or alternate. The report will note any remedial repairs that may be made, the date of any repairs, and the need for any follow-up inspection. All documentation will be available to the Environmental Coordinator for internal auditing purposes.

7.1.3 Records

Records pertaining to storage, use, and loss of fuels and lubricants are required by the Canadian Council of Ministers for the Environment (CCME) and the Fire Marshal (under the National Fire Code). The following records will be prepared and maintained by MHBL:

- reconciliation of bulk inventory from winter re-supply;
- weekly use summaries;
- weekly reconciliation for each storage tank;
- overfill alarm tests;
- pressure tests (if applicable);
- inspections and maintenance checks of the storage tank, piping, and delivery systems ;
- any alteration to the systems ;
- reports of leaks or losses;
- reports of spill responses; and
- records of training.

7.2 Explosives

7.2.1 Inventory Management

MHBL will record daily use of ammonium nitrate and high explosives. The Mine Superintendent will check the records weekly and complete a monthly reconciliation.

7.2.2 Inspection

Access to and use of explosives will be under the exclusive control of the mine superintendent. The Mine Superintendent will be responsible for inspection of all explosives facilities, including the ammonium nitrate storage area, the magazine for high explosive detonators and blasting caps, and the explosives manufacturing plant.

7.2.3 Records

The Federal Explosives Act requires that the following records be kept with regard to explosives products:

- annual quantity of each explosive issued to the mine site from the factory, including the dates of shipments; and
- annual quantity of each explosive present at the site.

MHBL will maintain weekly records of the following relating to the handling and preparation of explosives through the explosives plant:

- staffing;
- safety concerns or incidents;
- total explosives consumption;
- the amount of ammonium nitrate remaining on site ; and
- inventory of other explosives and accessories to be audited for fiscal month-end balances.

7.3 Process Plant Consumables

7.3.1 Inventory Management

Process plant consumables will be reconciled against orders on receipt. The Mill Superintendent will be responsible for reconciling the winter re-supply inventory.

7.3.2 Inspection

On each shift, the process plant operators will be responsible for daily inspection and operation of consumable storage facilities in the plant. Any problems will be noted and reported to the Mill Superintendent. The Mill Superintendent will be responsible for weekly or monthly inspections of plant consumables and storage areas.

7.3.3 Records

The plant operators will keep daily records of consumables use. Weekly and monthly summaries will be provided to the Mill Superintendent for records keeping.

7.4 Chemical Tracking

MHBL will develop and implement a procedure for tracking chemical purchase and use for the Doris North mine site. A tracking procedure meeting ISO-14001 guidelines is attached in Appendix E; the procedure will be modified early in mine operation to be consistent with other related operating procedures at Doris North.

8.0 TRAINING

Training associated with safety, health and the environment will be standardized, maintained and updated on a continual basis to ensure staff are adequately educated and informed about potential hazards.

8.1 General

As part of the site orientation for all employees, all staff and contractors at the site will receive the training in the following key areas associated with the handling of hazardous materials:

- WHMIS;
- emergency and spill response; and
- operations overview.

Mine employees will receive additional training in mine safety as specified by the Nunavut Mine Health and Safety Act and Regulations. Measures will be implemented to ensure compliance. Plant employees will receive additional training specific to their area of work and duties, including safe operating practices, safe handling and storage of chemicals, and use of personal protective equipment. Delivery of this training will be the responsibility of MHBL.

Periodically, Doris North staff will carry out fire drills. The drills will test emergency response procedures and will be scheduled so as not to disrupt work. The results of the drills will be recorded and forwarded to the Mine General Manager and the Health and Safety Committee. The results may indicate that additional, or refresher, training is required. Safety Committee recommendations will be enacted expeditiously.

Medical and mine rescue staff, and others responsible for first response to emergencies, will conduct periodic drills to test their emergency response procedures. Reports on the drills will be provided to Mine Site General Manager for action as required.

8.2 Fuel & Lubricants Handlers

Personnel who handle fuel and lubricants will be expected to be conversant with relevant MSDS information. As well, these personnel will be given training in the following:

- transportation of dangerous goods (TDGR);
- fuel handling procedures (outlined in Section 3);
- spill response and cleanup procedures for petroleum; and
- emergency response, especially firefighting procedures.

8.3 Explosives Handlers

Only trained and certified persons will work with explosives. MHBL will arrange for formal training and on-the-job training to ensure compliance with legislation. The Mine Superintendent will check the adequacy of training. Training requirements will include (but will not necessarily be limited to):

- specific fire procedures as per the Federal Explosives Act;
- first aid;
- transportation of dangerous goods (TDGR); and
- pump and hydraulics training.

All blasting personnel will be required to have a valid Blasting Certificate or Provisional Blasting Certificate that is issued in accordance with Part VII of the Mine Health and Safety Act and Regulations.

8.4 Plant Employees

All plant employees will be trained in spill and emergency response procedures.

9.0 PLAN EVALUATION, AUDIT & IMPROVEMENT

The HMMP will be reviewed and audited regularly to identify any components that need to be corrected, adjusted, upgraded, or otherwise modified. Audits will be both internal, by MHBL site personnel, and less often by external personnel, either MHBL Corporate staff or independent specialists. Aspects of the plan that affect the safety of employees at the facility and of the general public will be most important.

Formal evaluations of the plan will be documented, deficiencies will be noted, and progress in addressing deficiencies will be tracked in writing. Individual responsibilities and accountabilities will be assigned, and deadlines will be set for addressing the required changes. The Doris North Environmental Coordinator will assume overall responsibility for the process.

As part of MHBL's commitment to attain certification under the International Cyanide Management Code, it will sponsor regular audits by Institute-approved, third-party professionals to verify its compliance with the Code's principles and standards of practice with regard to cyanide handling.

In line with MHBL's goal of continuous improvement in all health and safety matters, all employees will be encouraged to offer suggestions for more efficient and safer materials handling procedures.

The Hazardous Materials Management Plan will be reviewed annually by the mine Health and Safety Committee considering the previous year's experience managing hazardous materials. Recommendations for additions or improvements will be considered in plan revisions. Plan update and revisions will be the responsibility of the mine's Environmental Coordinator. Plan revisions will be submitted to the NWB as a component of the annual report or more frequently depending on the nature of the updates.

This report, “Hazardous Materials Management Plan, Doris North Project, Nunavut, April 2007”, has been prepared by Miramar Hope Bay Ltd.

Prepared By

_____

Lawrence J. Connell, P.Eng.
General Manager, Environment

REFERENCES

Cumberland Resources Limited, 2005. Meadowbank Gold Project Hazardous Materials Management Plan, January 2005.

DeBeers Canada Snap Lake Project. Snap Lake Diamond Project Hazardous Materials Management Plan, dated January 2005

Diavik Diamond Mines Inc. Hazardous Materials Management Plan Operational Phase Version 8, dated March 2005

Miramar Hope Bay Limited, 2005. Emergency Response and Contingency Plan, Doris North Project, October 2005.

Miramar Hope Bay Limited, 2005. Technical Report, Doris North Project, June 2005.

MHBL Standard Operating Procedure – Hydrocarbon Fuel and Gas Dispersing Procedure, Revised Version. August 2006.

APPENDIX A

Material Safety Data Sheets

CYTEC

Technology ahead of its time™

MSDS: 0001787
Date: 05/04/2004
Supercedes: 10/10/2001

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: **AEROPHINE® 3418A Promoter**
Product Description: Flotation reagent in water
Use: Mining chemical

Supplied By: CYTEC CANADA INC., GARNER ROAD, P.O. BOX 240,
NIAGARA FALLS, ONTARIO, CANADA L2E 6T4 1-905/356-9000
EMERGENCY PHONE: In CANADA: 905/356-8310 In USA: 1-800/424-9300 or 1-703/527-3887.

Manufactured By: CYTEC CANADA INC., GARNER ROAD, P.O. BOX 240 NIAGARA FALLS, ONTARIO, CANADA L2E 6T4 PHONE: 905/356-9000

2. COMPOSITION/INFORMATION ON INGREDIENTS

WHMIS REGULATED COMPONENTS

Component / CAS No.	% (w/w)	OSHA (PEL):	ACGIH (TLV)	Carcinogen
Sodium diisobutyl-dithiophosphinate 13360-78-6	50 - 52	Not Established	Not Established	-

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

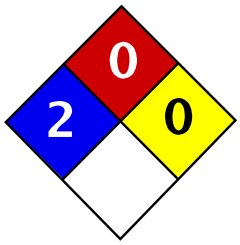
APPEARANCE AND ODOR:

Color:	yellowish
Appearance:	liquid
Odor:	odorless

STATEMENTS OF HAZARD:
DANGER! CAUSES EYE BURNS AND SKIN IRRITATION

POTENTIAL HEALTH EFFECTS

EFFECTS OF EXPOSURE:
The acute oral (rat) and acute dermal (rabbit) LD50 values for this material are 3.35 g/kg and greater than 5.0 g/kg, respectively. Moderate skin and severe eye irritation were produced during primary irritation studies in rabbits. Skin irritation was increased after repeated exposures in rabbit studies.
This material was not mutagenic in the Ames Salmonella Assay. Refer to Section 11 for toxicology information on the regulated components of this product.



Health	2
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Sodium metabisulfite MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium metabisulfite

Catalog Codes: SLS3025

CAS#: 7681-57-4

RTECS: VZ2000000

TSCA: TSCA 8(b) inventory: Sodium metabisulfite

CI#: Not available.

Synonym: Disodium disulfite; Disodium pyrosulfite; Sodium Pyrosulfite; Sodium Metabisulphite

Chemical Name: Pyrosulfurous acid, disodium salt

Chemical Formula: Na2S2O5

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sodium metabisulfite	7681-57-4	100

Toxicological Data on Ingredients: Sodium metabisulfite: ORAL (LD50): Acute: 1131 mg/kg [Rat]. DERMAL (LD50): Acute: >2000 mg/kg [Rat]. >1000 mg/kg [Guinea pig].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator), of eye contact (irritant).

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer), of ingestion, of inhalation (lung irritant).
CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC.
MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance may be toxic to upper respiratory tract, skin, eyes.
Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

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.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
When heated to decomposition it emits toxic fumes of SOx, Na2O.
Decomposes on heating to form sodium sulfate

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Do not ingest. Do not breathe dust. Avoid contact with skin. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Moisture sensitive. Air Sensitive

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 5 (mg/m3) [United Kingdom (UK)]
TWA: 5 (mg/m3) from ACGIH (TLV) [United States]
TWA: 5 (mg/m3) from NIOSH [United States]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Crystals solid or Powdered solid.)

Odor: odor of sulfur dioxide

Taste: Not available.

Molecular Weight: 190.13 g/mole

Color: White to yellowish.

pH (1% soln/water): 4.3 [Acidic.]

Boiling Point: Not available.

Melting Point: Decomposition temperature: 150°C (302°F)

Critical Temperature: Not available.

Specific Gravity: 1.4 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility:
Easily soluble in cold water, hot water.
Freely soluble in glycerol.
Slightly soluble in alcohol.
Moderately soluble in ethanol.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, heat, moisture, air, dust generation.

Incompatibility with various substances: Reactive with oxidizing agents, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Moisture sensitive Air sensitive.
It slowly oxidizes to sodium sulfate upon exposure to air and moisture.
Incompatible with sodium nitrite

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
Acute oral toxicity (LD50): 1131 mg/kg [Rat].
Acute dermal toxicity (LD50): >1000 mg/kg [Guinea pig].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC.
MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast.
May cause damage to the following organs: upper respiratory tract, skin, eyes.

Other Toxic Effects on Humans:
Hazardous in case of skin contact (irritant), of ingestion, of inhalation.
Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

May affect genetic material (mutagenic) based on animal test data.
May cause adverse reproductive effects based on animal test data.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: May cause skin irritation.
Eyes: May cause eye irritaiton.
Inhalation: May cause respiratory tract irritation with coughing and wheezing.
Ingestion: May be harmful if swallowed. May cause gastrointestinal tract irritation irritation with abdominal pain, nausea, vomiting, diarrhea, violent colic, and possible gastri hemorrhaging. May affect behavior/central nervous system and cause central nervous system depression/seizures. It may also affect the cardiovasular system (hypotension, tachycardia, cardiovascular collapse), Ingestion of sulfite compounds may cause a severe allergic reaction (anaphylactoid symptoms) in sensitive individuals and some asthmatics.
Chronic Potential Health Effects:
Skin: Prolonged or repeated skin contact may cause allergic dermatitis.
Ingestion: Prolonged or repeated ingestion may affect the liver, urinary system, and metabolism (weight loss). Future exposures may also cause asthma like allergy with coughing, shortness of breath, wheezing and/or chest tightness.
Inhalation: Prolonged or repeated inhalation may irritate the lungs, may cause bronchitis to develop with cough, phlegm and/or shortness of breath.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Sodium metabisulfite
Illinois toxic substances disclosure to employee act: Sodium metabisulfite
Rhode Island RTK hazardous substances: Sodium metabisulfite
Pennsylvania RTK: Sodium metabisulfite
Minnesota: Sodium metabisulfite

Massachusetts RTK: Sodium metabisulfite
New Jersey: Sodium metabisulfite
California Director's List of Hazardous Substances: Sodium metabisulfite
TSCA 8(b) inventory: Sodium metabisulfite
TSCA 4(a) ITC priority list: Sodium metabisulfite
TSCA 8(a) PAIR: Sodium metabisulfite
TSCA 8(d) H and S data reporting: Sodium metabisulfite: effective: 1/26/94; sunset: 6/30/98

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).
EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/11/2005 12:35 PM

Last Updated: 10/11/2005 12:35 PM

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information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.

Material Safety Data Sheet

SULPHURIC ACID

Infosafe no. AJ1YR **Issue Date** September 2001 **Status** ISSUED by APSSC
Classified as hazardous according to criteria of NOHSC

COMPANY DETAILS

Company Name	Asia Pacific Specialty Chemicals Limited (ABN 32000316138)
Address	15 Park Road SEVEN HILLS NSW 2147
Emergency Tel.	1800 022 037 (24H)
Tel/Fax	Tel: (02) 9839 4000 Fax: (02) 9674 6225
Other Information	AUSTRALIA: Division of: Asia Pacific Specialty Chemicals Limited A.C.N. 000 316 138 15 Park Road, Seven Hills, NSW, 2147 Tel: (02) 9839 4000, Fax: (02) 9674 6225 NEW ZEALAND: Asia Pacific Specialty Chemicals (NZ) Limited 119 Carbine Road, Mt. Wellington, Auckland 6 Tel: (09) 276 4019, Fax: (09) 276 7231.

IDENTIFICATION

Product Code AR 00000534

Product Name SULPHURIC ACID

Proper Shipping Name SULFURIC ACID

Other Names	**Name**	**Manf. Code**
	SULPHURIC ACID SG 1.500 - 60%	BATT 00002227
	SULPHURIC ACID SG 1.62 - 70%	BATT 00002238
	SULPHURIC ACID MILK TEST	LC 00001599
	SULPHURIC ACID 98%	TECH 00000535
	SULPHURIC ACID SG 1.235	BATT 00004725
	SULPHURIC ACID	UL 00001262
	Sulfuric acid	
	Oil of vitriol	
	Fertiliser acid	
	Electrolyte acid	
	SULPHURIC ACID SG 1.820 - 92%	BATT 00001596
	SULPHURIC ACID 70%	TECH 00001593
	SULPHURIC ACID 80%	TECH 00004364
	SULPHURIC ACID 89% MILK TEST	LC 00001598
	SULPHURIC ACID 92%	CP 00001637

UN Number 1830

DG Class 8

Packing Group II

Hazchem Code 2P

Poisons Schedule S6

Product Use Fertilizers, explosives, electroplating, dyes, drugs, detergents, adhesives, plastics, paints, tanning, food processing.

Physical Data

Appearance	Colourless (pure) to brownish liquid, denser than water, choking fumes if heated, hygroscopic.
Melting Point	10 degrees C
Boiling Point	270 degrees C
Vapour Pressure	< 0.001 mm Hg at 20 degrees C
Specific Gravity	approx 1 - 1.8 mg/ml
Flash Point	No Data
Flamm. Limit LEL	No Data

Other Properties

pH Value	0.3, 1N solution
Formula	H2SO4
Molecular Weight	98.08
Other Information	Soluble in water in all proportions, soluble in most organic solvents (may react).

Ingredients

Ingredients	**Name**	**CAS**	**Proportion**
	Sulphuric acid	7664-93-9	0-98 %
	Water to make total of 100%		

HEALTH HAZARD INFORMATION

Health Effects

Acute - Swallowed	Can kill if swallowed. Will cause severe damage to the mucous membranes. May cause severe burns to the mouth,throat and stomach. Ingestion can cause nausea and vomiting. Ingestion can result in abdominal pain.
Acute - Eye	Corrosive to eyes; contact can cause corneal burns. Permanent eye damage,including loss of sight,may occur.
Acute - Skin	Highly corrosive to skin. Causes severe burns.
Acute - Inhaled	Harmful by inhalation. Possible harmful corrosive effects. High concentrations of vapour can cause severe irritation of the respiratory tract.

First Aid

Swallowed	Rinse mouth thoroughly with water immediately. Give water to drink. DO NOT induce vomiting. Seek immediate medical assistance. Poison Information Centres in each State capital city can provide additional assistance for scheduled poisons.
Eye	Immediately irrigate with copious quantity of water for at least 15 minutes. Eyelids to be held open. Seek immediate medical assistance.
Skin	Wash affected areas with copious quantities of water immediately. Remove contaminated clothing and wash before re-use. Treat skin and clothing with 1% sodium bicarbonate solution to neutralize acid residues. If irritation occurs seek medical advice.
Inhaled	Remove victim from exposure - avoid becoming a casualty. Allow patient to assume most comfortable position and keep warm.Keep at rest until fully recovered. If breathing laboured and patient cyanotic (blue), ensure airways are clear and have qualified person give oxygen through a face mask. If breathing has stopped apply artificial respiration at once. In the event of cardiac arrest, apply external cardiac massage. Seek medical attention.

Advice to Doctor

Advice to Doctor	Consult Poisons Information Centre. Treat symptomatically as for strong acids.

Other Health Hazard Information

PRECAUTIONS FOR USE

Exposure Limits	Name	STEL (mgm3)	STEL (ppm)	TWA (mgm3)	TWA (ppm)	FootNote
	Sulphuric acid	3		1		

Other Exposure Info. TLV/TWA: 1 mg/m3, STEL: 3 mg/m3 Worksafe Aust.
Odour Threshold: > 1 mg/m3 IDLH Value: 80 mg/m3

Eng. Controls Maintain concentration below recommended exposure limit.
Use with local exhaust ventilation or:
Combination particulate/gas respirator, Class B, (Inorganic vapour).
Self contained breathing apparatus may be needed for prolonged periods of exposure.

Personal Protection

Protective Equip. The following personal protective equipment must be worn.
Overalls or similar protective apparel.
Safety glasses,goggles or faceshield as appropriate.
Rubber boots.
Elbow-length PVC gloves.
Splash apron.
Wash contaminated clothing and protective equipment before storing/re-using.
Avoid all contact.

Flammability

Fire Hazards The product is considered non-combustible. Its other hazardous properties should however be considered if it is involved in a fire.
Contact with moisture or water may generate heat.
Contact with strong alkalis may generate heat.

Other Precautions Prolonged exposure to mists and vapours can cause erosion of teeth, chronic irritation of eyes, nose and throat and chronic inflammation of airways. 77 - 98% acid causes 2nd and 3rd degree burns of skin on short contact and is very injurious to the eyes.
In October 1992 the International Agency for Research on Cancer (IARC) classified occupational exposure to strong inorganic acid mists containing sulphuric acid as carcinogenic to humans, ie a Group 1 carcinogen.
Further information can be obtained from N.S.W WorkCover Authority publication dated September 1993.

SAFE HANDLING INFORMATION

Storage and Transport

Storage Precautions	Store in well ventilated area. Store in a cool,dry place. Keep dry - reacts with water; may lead to drum rupture. Keep containers securely sealed and protected against physical damage. Store away from strong bases. Not to be loaded with Class 1, 4.3, 5.1, 5.2, 6*,7, Foodstuff and foodstuff empties. (* where the Class 6 substance is a cyanide and the Class 8 substance is an acid).
Other Storage Info.	Corrosive to most metals in the presence of moisture, liberating hydrogen gas, (potential explosion). Reacts violently or explosively with a wide range of organic and inorganic chemicals, including water, alcohol, carbides, chlorates, picrates, nitrates, metals and other combustibles.
Proper Shipping Name	SULFURIC ACID
EPG Number	8A2
IERG Number	40
Packaging Method	5.9.8RT8

Spills and Disposal

Spills & Disposal	Shut off all possible sources of ignition. Clear area of all unprotected personnel. Contain using sand and earth - prevent run-off into drains and waterways. For large spills notify Emergency Services. In the event of a small spill: Neutralise remaining product with lime or soda ash, adjusting pH to 6-10. Flush to sewer as a greatly diluted solution. Wear full protective clothing (see Personal Protection/Ventilation Section) .Self contained breathing apparatus may be needed for prolonged periods of exposure. Refer to appropriate State Waste Disposal Authority Observe local regulations.

Fire/Explosion Hazard

Fire/Explos. Hazard	Decomposes on heating emitting toxic fumes. Oxides of sulphur Fire fighters to wear self-contained breathing apparatus if risk of exposure to products of decomposition. Reacts violently with water.
Hazchem Code	2P

OTHER INFORMATION

Toxicology	Oral LD50(rat): 2140 mg/kg
Environ. Protection	Highly toxic to aquatic life. Avoid contaminating waterways. The product is strongly acidic and hence may react with metals to produce hydrogen, a flammable gas.
Risk Statement	R35 Causes severe burns.
Safety Statement	S2 Keep out of reach of children. S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S30 Never add water to this product. S24/25 Avoid contact with skin and eyes.
Pkg. & Labelling	As required by the ADG Code and the Standard for the Uniform Scheduling of Drugs and Poisons. RISK AND SAFETY PHRASES R35- Causes severe burns. S2- Keep out of reach of children S26- In case of contact with eyes ,rinse immediately with plenty of water and contact a doctor or Poisons Information Centre. S30- Never add water to this product.
Hazard Category	Very Corrosive
Manufacturers Advice	Dilution of acid should always be carried out by slowly adding acid to water with constant stirring. Concentrated acid reacts violently with water, generating heat and causing splattering. In the case of fire, use extinguisher appropriate for burning material. Water used on adjacent fires must be carefully handled if acid has spilt.
References	CCINFO, CHRIS
Empirical Formula & Structural Formula	H2SO4
Other Information	Sulphuric acid: with not more than 51% acid, Group text EPG 8A1 with more than 51% acid, Group text EPG 8A2

CONTACT POINT

Contact Australia: Business Hours: Mr Bob Wells, Tel: (02) 9839 4000
After Hours: Tel: 1800 022 037
NEW ZEALAND: Mr. Lloyd Williams, (09) 276 4019
IMPORTANT ADVICE:
This MSDS summarises our best knowledge of the health and safety hazard information of the product and how to safely handle and use the product in the workplace. Each user should read this MSDS and consider the information in the context of how the product will be handled and used in the workplace including its use in conjunction with other products. If clarification or further information is needed to ensure that an appropriate risk assessment can be made, the user should contact APS Chemicals. Our responsibility for products sold is subject to our standard terms and conditions, a copy of which is sent to our customers and is also available on request.

End of MSDS

SODIUM CYANIDE

MSDS Number: S3458 --- *Effective Date: 12/08/96*

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1. Product Identification

Synonyms: Hydrocyanic acid, sodium salt; Cyanogran
CAS No.: 143-33-9
Molecular Weight: 49.01
Chemical Formula: NaCN
Product Codes: J.T. Baker: 3662, 3663 Mallinckrodt: 7616

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2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sodium Cyanide	143-33-9	90 - 100%	Yes

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3. Hazards Identification

Emergency Overview

DANGER! MAY BE FATAL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. CONTACT WITH ACIDS LIBERATES POISONOUS GAS. CAUSES BURNS TO SKIN, EYES, AND RESPIRATORY TRACT. AFFECTS BLOOD, CARDIOVASCULAR SYSTEM, CENTRAL NERVOUS SYSTEM AND THYROID.

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

Health Rating: 3 - Severe (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate
Contact Rating: 3 - Severe (Life)
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES
Storage Color Code: Blue (Health)

Potential Health Effects

In most cases, cyanide poisoning causes a deceptively healthy pink to red skin color. However, if a physical injury or lack of oxygen is involved, the skin color may be bluish. Reddening of the eyes and pupil dilation are symptoms of cyanide poisoning. Cyanosis (blue discoloration of the skin) tends to be associated with severe cyanide poisonings.

Inhalation:
Corrosive to the respiratory tract. The substance inhibits cellular respiration and may cause blood, central nervous system, and thyroid changes. May cause headache, weakness, dizziness, labored breathing nausea and vomiting, which can be followed by weak and irregular heart beat, unconsciousness, convulsions, coma and death.

Ingestion:
Highly Toxic! Corrosive to the gastro-intestinal tract with burning in the mouth and esophagus, and abdominal pain. Larger doses may produce sudden loss of consciousness and prompt death from respiratory arrest. Smaller but still lethal doses may prolong the illness for one or more hours. Bitter almonds odor may be noted on the breath or vomitus. Other symptoms may be similar to those noted for inhalation exposure.

Skin Contact:

Corrosive. May cause severe pain and skin burns. Solutions are corrosive to the skin and eyes, and may cause deep ulcers which heal slowly. May be absorbed through the skin, with symptoms similar to those noted for inhalation.

Eye Contact:
Corrosive. Symptoms may include redness, pain, blurred vision, and eye damage.

Chronic Exposure:
Prolonged or repeated skin exposure may cause a "cyanide" rash and nasal sores.

Aggravation of Pre-existing Conditions:
Workers using cyanides should have a preplacement and periodic medical exam. Those with history of central nervous system, thyroid, skin, heart or lung diseases may be more susceptible to the effects of this substance.

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4. First Aid Measures

IN CASE OF CYANIDE POISONING, start first aid treatment immediately, then get medical attention. A cyanide antidote kit (amyl nitrite, sodium nitrite and sodium thiosulfate) should be available in any cyanide work area. Actions to be taken in case of

cyanide poisoning should be planned and practiced before beginning work with cyanides. Oxygen and amyl nitrite can be given by a first responder before medical help arrives. Allow victim to inhale amyl nitrite for 15-30 seconds per minute until sodium nitrite and sodium thiosulfate can be administered intravenously (see Note to Physician). A new amyl nitrite ampule should be used every 3 minutes. If conscious but symptoms (nausea, difficult breathing, dizziness, etc.) are evident, give oxygen. If consciousness is impaired (non-responsiveness, slurred speech, confusion, drowsiness) or the patient is unconscious but breathing, give oxygen and amyl nitrite by means of a respirator. If not breathing, give oxygen and amyl nitrite immediately by means of a positive pressure respirator (artificial respiration).

Inhalation:
If inhaled, remove to fresh air. Administer antidote kit and oxygen per pre-planned instructions if symptoms occur. Keep patient warm and at rest. Do not give mouth to mouth resuscitation.

Ingestion:
If ingested, antidote kit and oxygen should be administered per above. If the patient is conscious, immediately give the patient activated charcoal slurry. Never give anything by mouth to an unconscious person. Do not induce vomiting as it could interfere with resuscitator use.

Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse. Administer antidote kit and oxygen per preplanned instructions if symptoms occur.

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:
If patient does not respond to amyl nitrite, inject intravenously with 10mL of a 3% solution of sodium nitrite at a rate of not more than 2.5 to 5 mL per minute.Once nitrite administration is complete, follow directly with 50 mL of a 25% solution of sodium thiosulfate at the same rate by the same route. Give victim oxygen and keep under observation. If exposure was severe, watch victim for 24-48 hours. If signs of cyanide poisoning persist or reappear, repeat nitrite and thiosulfate injections 1 hour later in 1/2 the original doses. Cyanocabalamin (B12), 1 mg intramuscularly, may speed recovery. Moderate cyanide exposures need be treated only by supportive measures such as bed rest and oxygen.

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5. Fire Fighting Measures

Fire:
Not combustible, but upon decomposition or contact with acids, this material releases highly flammable and toxic hydrogen cyanide gas.

Explosion:
Not considered an explosion hazard, but upon heating with chlorates or nitrites to 450C (842F) may cause an explosion. Violent explosion occurs if melted with nitrite salt. Sealed containers may rupture when heated.

Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire. Do Not use carbon dioxide. Carbon dioxide can react with this material in the presence of moisture to produce hydrogen cyanide. Water spray may be used to keep fire exposed containers cool. Reacts slowly with water to form hydrogen cyanide.

Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

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6. Accidental Release Measures

Spills: Ventilate area of leak or spill. Allow only qualified personnel to handle spill. Clean-up personnel require protective clothing and respiratory protection from vapors. Collect material and place in a closed container for recovery or disposal. Do not flush to sewer! Decontaminate liquid or solid residues in spill area with sodium or calcium hypochlorite solution. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

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7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Separate from incompatibles. Workers must carefully follow good hygienic practices, including no eating, drinking, or smoking in workplace. Proper use and maintenance of protective equipment is essential. Workers using cyanide need preplacement and annual medical exams. Special training should be given to workers using cyanide. 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. Do not store near combustibles or flammables because subsequent fire fighting with water could lead to cyanide solution runoff. Do not store under sprinkler systems. All persons with the potential for cyanide poisoning should be trained to provide

immediate First Aid using oxygen and amyl nitrite. A cyanide anitdote kit (amyl nitrite, sodium nitrite, and sodium thiosulfate) should be readily available in cyanide workplaces. The antidotes should be checked annually to ensure they are still within their shelf-lives. Identification of community hospital resources and emergency medical squads in order to equip and train them on handling cyanide emergencies is essential.

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8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL): 5 mg/m3 skin (TWA) (as CN) -ACGIH Threshold Limit Value (TLV): 5 mg/m3 (STEL) Ceiling, skin, as CN

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

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. This substance has poor warning properties.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

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

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9. Physical and Chemical Properties

Appearance:
White deliquescent granular solid.

Odor:
Almond odor. Bitter almonds.

Solubility:
48 g/100 cc @ 10C (50F)

Specific Gravity:
1.60 @ 25C/4C

pH:
Aqueous solutions are strongly alkaline.

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

Boiling Point:
1496C (2725F)

Melting Point:
564C (1047F)

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

Vapor Pressure (mm Hg):
1 @ 817C (1503F)

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

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10. Stability and Reactivity

Stability:
Very stable when dry. Moisture will cause slow decomposition, releasing poisonous hydrogen cyanide gas.

Hazardous Decomposition Products:
Emits toxic fumes of cyanide and oxides of nitrogen when heated to decomposition.

Hazardous Polymerization:
Will not occur.

Incompatibilities:
Acid. nitrates, nitrites, chlorates, fluorine, magnesium, and strong oxidizers. Reacts with acids to liberate toxic and flammable hydrogen cyanide gas. Water or weak alkaline solutions can produce dangerous amounts of hydrogen cyanide in confined areas. Reacts with carbon dioxide in air to form hydrogen cyanide gas.

Conditions to Avoid:
Heat, moisture, incompatibles.

---

11. Toxicological Information

Oral rat LD50: 6440 ug/kg. Investigated as a tumorigen, mutagen, reproductive effector.

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

Ingredient	Known	NTP Carcinogen - Anticipated	IARC Category
Sodium Cyanide (143-33-9)	No	No	None

---

12. Ecological Information

Environmental Fate:
No information found.

Environmental Toxicity:
This material is expected to be very toxic to aquatic life. This material is expected to be very toxic to terrestrial life.

---

13. Disposal Considerations

Cyanides must be oxidized to harmless waste before disposal. An alkaline solution (pH about l0) is treated with chlorine or commercial bleach in excess to decompose cyanide. When cyanide-free, it can be neutralized. Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

---

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: RQ, SODIUM CYANIDE
Hazard Class: 6.1

UN/NA: UN1689
Packing Group: I
Information reported for product/size: 100LB

International (Water, I.M.O.)

Proper Shipping Name: SODIUM CYANIDE, SOLID
Hazard Class: 6.1
UN/NA: UN1689
Packing Group: I
Information reported for product/size: 100LB

International (Air, I.C.A.O.)

Proper Shipping Name: SODIUM CYANIDE, SOLID
Hazard Class: 6.1
UN/NA: UN1689
Packing Group: I
Information reported for product/size: 100LB

---

15. Regulatory Information

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

Ingredient	TSCA	EC	Japan	Australia
Sodium Cyanide (143-33-9)	Yes	Yes	Yes	Yes

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

	--Canada--				
Ingredient	Korea	DSL	NDSL	Phil.	
Sodium Cyanide (143-33-9)	Yes	Yes	No	Yes	

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

	-SARA 302-	------SARA 313------		
Ingredient	RQ	TPQ	List	Chemical Catg.
Sodium Cyanide (143-33-9)	10	100	No	Cyanide comp

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

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Sodium Cyanide (143-33-9)	10	P106	No

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

Australian Hazchem Code: 4X
Poison Schedule: S7

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: 3 **Flammability:** 0 **Reactivity:** 1

Label Hazard Warning:
DANGER! MAY BE FATAL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. CONTACT WITH ACIDS LIBERATES POISONOUS GAS. CAUSES BURNS TO SKIN, EYES, AND RESPIRATORY TRACT. AFFECTS BLOOD, CARDIOVASCULAR SYSTEM, CENTRAL NERVOUS SYSTEM AND THYROID.

Label Precautions:
Do not breathe dust. Do not get in eyes, on skin, or on clothing. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling.

Label First Aid:
IN ALL CASES, GET MEDICAL ATTENTION IMMEDIATELY. KEEP A CYANIDE ANTIDOTE KIT (amyl nitrite, sodium nitrite and sodium thiosulfate) in area of product use or storage. First-aiders must take precautions to avoid contact with cyanide substance. If ingested, administer antidote kit and oxygen per pre-planned instructions. If the patient is conscious, immediately give the patient activated charcoal slurry. Never give anything by mouth to an unconscious person. Do not induce vomiting as it could interfere with resuscitator use. If inhaled, remove to fresh air. Administer antidote kit and oxygen per pre-planned instructions if symptoms occur. Keep patient warm and at rest. Do not give mouth to mouth resuscitation. 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. Administer antidote kit and oxygen per preplanned instructions if symptoms occur.

Product Use:
Laboratory Reagent.

Revision Information:
Pure. New 16 section MSDS format, all sections have been revised.

Disclaimer:
****
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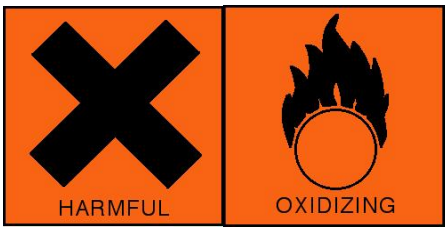
****
********** **Prepared by:** Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

Safety (MSDS) data for sodium nitrate



Click here for data on sodium nitrate in student-friendly format, from the HSci project

---

General

Synonyms: nitratine, soda niter, soda nitre, Chile saltpetre, cubic nitre, sodium saltpeter, nitric acid sodium salt
Molecular formula: $NaNO_3$
CAS No: 7631-99-4
EC No: 231-554-3

Physical data

Appearance: colourless crystals or white powder
Melting point: 306 C
Boiling point:
Vapour density: 2.9 (air = 1)
Vapour pressure:
Density (g cm^{-3}): 2.26
Flash point:
Explosion limits:
Autoignition temperature:
Water solubility: soluble

Stability

Stable. Strong oxidizer - may ignite flammable material. Incompatible with cyanides, combustible material, strong reducing agents, aluminium.

Toxicology

Harmful if swallowed or inhaled. Skin, eye and respiratory irritant.

Toxicity data

(The meaning of any abbreviations which appear in this section is given here.)
ORL-CHD LDLO 22.5 mg kg^{-1}
ORL-RAT LD50 1267 mg kg^{-1}
IVN-MUS LD50 175 mg kg^{-1}
ORL-RBT LD50 2680 mg kg^{-1}

Risk phrases

(The meaning of any risk phrases which appear in this section is given here.)
R8 R20 R22 R36 R37 R38.

Transport information

(The meaning of any UN hazard codes which appear in this section is given here.)
UN No 1498. Hazard class 5.1. Packing group III. UK transport category 3.

Personal protection

Safety glasses.

Safety phrases

(The meaning of any safety phrases which appear in this section is given here.)
S17 S26 S27 S36 S37 S39.

Safety (MSDS) data for borax decahydrate

General

Synonyms: antipyonin, borax, boricin, disodium tetraborate decahydrate, three elephant, tronabor, sodium pyroborate decahydrate, sodium tetraborate decahydrate, sodium borate 10-hydrate, sodium borate decahydrate, sodium biborate decahydrate
Molecular formula: $B_4Na_2O_7\ 10H_2O$
CAS No: 1303-96-4
EINECS No:

Physical data

Appearance: white crystals
Melting point: 75 C
Boiling point: 320 C
Vapour density:
Vapour pressure:
Density (g cm^{-3}): 1.73
Flash point:
Explosion limits:
Autoignition temperature:
Water solubility: moderate

Stability

Stable. Reacts violently with potassium, acid anhydrides. Incompatible with strong acids, metallic salts.

Toxicology

Possible risk that this may cause reproductive disorders, based on tests with laboratory animals. Eye and skin irritant. Harmful by ingestion. May be harmful by inhalation. Typical TLV/TWA 5 mg/m3.

Toxicity data

(The meaning of any toxicological abbreviations which appear in this section is given here.)
ORL-INF LDLO 1000 mg kg^{-1}
ORL-MAN LDLO 709 mg kg^{-1}
ORL-RAT LD50 2660 mg kg^{-1}
IPR-MUS LD50 2711 mg kg^{-1}
IVN-MUS LD50 1320 mg kg^{-1}

Risk phrases

(The meaning of any risk phrases which appear in this section is given here.)
R22 R36 R37 R38.

Transport information

Non-hazardous for air, sea and road freight.

Personal protection

Safety glasses, adequate ventilation.

Safety phrases

(The meaning of any safety phrases which appear in this section is given here.)
S22 S26 S36 S37 S39 S45.

Material Safety Data Sheet

Orfom(R) PAX

February 15, 2002
MSDS #: 76060
Revision #: 0

CHEVRON PHILLIPS CHEMICAL COMPANY LP
10001 Six Pines Drive
The Woodlands, TX 77380

PHONE NUMBERS
HEALTH:
Chevron Phillips Emergency Information Center 866.442.9628 (North America) and 1.832.813.4984(International)
TRANSPORTATION:
North America: CHEMTREC 800.424.9300 or 703.527.3887
ASIA: 1.703.527.3887
EUROPE: BIG .32.14.584545 (phone) or .32.14.583516 (telefax)
SOUTH AMERICA SOS-Cotec
Inside Brazil: 0800.111.767
Outside Brazil: 55.19.3467.1600
Technical Services: (832) 813-4862
For Additional MSDSs: (800) 852-5530

A. Product Identification

Synonyms: Not Established
Chemical Name: Potassium Amyl Xanthate
Chemical Family: Dithiocarbonate
Chemical Formula: C5H11OCS2K
CAS Reg. No.: 2720-73-2
Product No.: Not Established

Product and/or Components Entered on EPA's TSCA Inventory: YES
This product is in U.S. commerce, and is listed in the Toxic Substances Control Act (TSCA) Inventory of Chemicals; hence, it may be subject to applicable TSCA provisions and restrictions.

Canadian Inventory Listing Status: DSL
All ingredients are listed in the Domestic Substances List (DSL). Impurities are exempt in accordance with Section 3 of the Canadian Environmental Protection Act (CEPA).

B. Components

Ingredients	CAS Number	% By Wt.	OSHA PEL	ACGIH TLV
Potassium Amyl Xanthate	2720-73-2	93 min.	NE	NE
Potassium Hydroxide	1310-58-3	0.15	2 ppm(c)	2 ppm (c)

(c)Ceiling Limit
See Section F, for additional Recommended Exposure Limits

C. Personal Protection Information

Ventilation: Use adequate ventilation to control exposure below recommended level.

Respiratory Protection: Not generally required unless needed to prevent respiratory irritation.

Eye Protection: Use safety glasses with side shields.

Skin Protection: No special garments required. Avoid unnecessary skin contamination. Use impervious rubber gloves.

NOTE: Personal protection information shown in Section C is based upon general information as to normal uses and conditions. Where special or unusual uses or conditions exist, it is suggested that the expert assistance of an industrial hygienist or other qualified professional be sought.

D. Handling and Storage Precautions

Do not get in eyes, on skin or on clothing. Do not breathe vapors, mist, fume or dust. Wear protective equipment and/or garments described above if exposure conditions warrant. Wash thoroughly after handling. Launder contaminated clothing before reuse. Use only with adequate ventilation. When entry into or exit from concentrations of unknown exposure, use NIOSH/MSHA approved self-contained breathing apparatus (SCBA). Wash thoroughly after handling.

Store in a closed containers. Store in cool, well-ventilated area away from ignition sources. Protect from moisture and oxidants.

E. Reactivity Data

Stability: Stable
Conditions to Avoid: Not Applicable
Incompatibility (Materials to Avoid): Oxygen and strong oxidizing Agents and Moisture

Hazardous Polymerizatio: Will Not Occur
Conditions to Avoid: Not Applicable
Hazardous Decomposition Products: Carbon oxides and various hydrocarbons formed when burned.

F. Health Hazard Data

Recommended Exposure Limits:

Treat as a nuisance particulate	OSHA PEL	ACGIH TVL
Total Dust	15 mg/m3	10 mg/m3
Respirable Fraction	5 mg/m3	NE

Acute Effects of Overexposure:

Eye: Slight eye irritation

Skin: Slight eye irritation

Inhalation: Aerosol may cause irritation to nose, throat or lungs..

Ingestion: No data available.

Subchronic and Chronic Effects of Overexposure:

Aerosol has produce liver, kidney and nervous system changes in laboratory animals. Carbon disulfide may be released upon heating or if conditions become acidic. Then headache, dizziness, nervousness, loss of appetite, psychosis, nerve, heart, kidney or liver changes may develop..

Other Health Effects:

No known applicable information.

Health Hazard Categories:

	Animal	Human		Animal	Human
Known Carcinogen	___	___	Toxic	___	___
Suspect Carcinogen	___	___	Corrosive	___	___
Mutagen	___	___	Irritant	___	___
Teratogen	___	___	Target Organ Toxin	_X_	___
Allergic Sensitizer	___	___	Specify - Liver, Kidney,& Nerve Toxin-Animal		
Highly Toxic	___	___			

Canadian WHIMS:

First Aid and Emergency Procedures:

Eye: Flush eyes with running water for at least fifteen minutes. If irritation or adverse symptoms develop, seek medical attention.

Skin: Wash skin with soap and water. If irritation develops, seek Medical attention

Inhalation: Remove from exposure.

Ingestion: Promptly induce vomiting and seek medical attention

G. Physical Data

Appearance:	Yellowish-grey Powder or Pellets
Odor:	Mild
Boiling Point:	Not Applicable
Vapor Pressure:	Not Applicable
Vapor Density (Air = 1):	Not Applicable
Solubility in Water:	Appreciable
Specific Gravity (H2O = 1):	Not Established
Percent Volatile by Volume:	<1
Viscosity:	Not Applicable

H. Fire and Explosion Data

Flash Point (Method Used):	Not Applicable
Flammable Limits (% by Volume in Air):	LEL - Not Applicable UEL - Not Applicable
Fire Extinguishing Media:	Dry chemical, foam or carbon dioxide (CO2)
Special Fire Fighting Procedures:	Evacuate area of all unnecessary personnel. Shut off source, if possible. Use NIOSH/MSHA approved self-contained breathing apparatus and other protective equipment and/or garments described in Section C if conditions warrant. Water fog or spray may be used to cool exposed containers and equipment.
Fire and Explosion Hazards:	Sulfur oxides and carbon disulfide Formed when burned.

I. Spill, Leak and Disposal Procedures

Precautions Required if Material is Released or Spilled:
Evacuate area of all unnecessary personnel. Wear protective equipment and/or garments described in Section C if exposure conditions warrant. When entry into or exit from concentrations of unknown exposure, use NIOSN/MSHA approved self-contained breathing apparatus (SCBA). Contain spill. Protect from ignition. Keep out of water sources and sewers. Sweep or vacuum up spill. Transfer to disposal drums using non-sparking equipment..

Waste Disposal (Insure Conformity with all Applicable Disposal Regulations):
Incinerate or place in permitted waste management facility.

J. DOT Transportation

Shipping Name: Not Applicable
Hazard Class: Not Applicable
ID Number: Not Applicable
Packing Group: Not Applicable
Marking: Not Applicable
Label: Not Applicable
Placard: Not Applicable
Hazardous Substance/RQ: Not Applicable
Shipping Description: Not Applicable
Packaging References: Not Applicable

K. RCRA Classification - Unadulterated Product as a Waste

Not Applicable

L. Protection Required for Work on Contaminated Equipment

Contact immediate supervisor for specific instructions before work is initiated. Wear protective equipment and/or garments described in Section C if exposure conditions warrant. When entry into or exit from concentrations of unknown exposure, use NIOSH/MSHA approved self-contained breathing apparatus (SCBA).

.

M. Hazard Classification

_X_ This product meets the following hazard definition(s) as defined by the Occupational Safety and Health Hazard Communication Standard (29 CFR Section 1910.1200):

___ Combustible Liquid
___ Compressed Gas
___ Flammable Gas
___ Flammable Liquid
___ Flammable Solid
___ Flammable Aerosol
___ Explosive
_X_ Health Hazard (Section F)
___ Organic Peroxide
___ Oxidizer
___ Pyrophoric
___ Unstable
___ Water Reactive

___ Based on information presently available, this product does not meet any of the hazard definitions of 29 CFR Section 1910.1200.

N. Additional Comments

REVISION STATEMENT
This revision reviews entire MSDS.

SARA 313

As of the preparation date, this product did not contain a chemical or chemicals subject to the reporting requirements of Section 313 of Title III of Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372

For more information and technical assistance contact:

Chevron Phillips Chemical Company LP
P.O. Box 4910
The Woodlands, TX 77387-4910
800.858.4327

ORFOM® PAX

potassium amyl xanthate

ORFOM® PAX is available in both powder and pellet forms. Potassium amyl xanthate is a well known, versatile collector for sulfide minerals including sulfides of copper, lead, nickel and zinc. It is generally considered the most powerful, least selective xanthate and is often used where high selectivity is not required. Selectivity is often ore dependant and testing is required to determine the optimum collector as well as the optimum dosage of each collector. ORFOM® PAX is manufactured to close specifications to ensure product consistency. ORFOM® PAX is available in both drums and wooden boxes.

Application

ORFOM® PAX potassium amyl xanthate is a high quality xanthate for sulfide mineral flotation.

Availability

ORFOM® PAX is available in drums and wooden boxes.

Material Handling

Do not get in eyes, on skin, or on clothing. Do not breathe vapors, mist, fume or dust. Wear personal protective equipment described in the Material Safety Data Sheet (MSDS) if exposure conditions warrant. Wash thoroughly after handling. Launder contaminated clothing before reuse. Use only with adequate ventilation. Store in a cool well-ventilated area away from ignition sources. Store in closed container. Protect from moisture and oxidants. If spilled, shut off source if possible and contain spill. Protect from ignition. Keep out of water sources and sewers. Follow normal clean-up procedures for solid spills. Control dust. Insure conformity with all applicable disposal regulations.

Refer to the Material Safety Data Sheet for complete safety and health information.

Typical Properties

Property	Value
Composition, % Typical	
Purity, Minimum	90%
Free Alkali, Maximum	0.5%
Color	Yellow

BEST SAND
CORPORATION

Material Safety Data Sheet

Date: June 29, 2005 **Supersedes:** March 21, 2005

SECTION 1 : PRODUCT IDENTIFICATION

Trade Name as Labeled: Silica, Lake or Bank Sand; All Grades
Chemical Name and Formula: Silica, mainly in the form of quartz (crystalline silica); SiO_2

Manufacturer:
Best Sand Corporation
P.O. Box 87
Chardon, OH 44024
Phone: (440) 285-3132

Emergency Telephone Number: (800) 281-9876

"This Best Sand Corporation product is not intended for and is strictly prohibited for sandblasting."

SECTION 2: COMPOSITION/INFORMATION ON INGREDIENTS

Chemical	CAS Number	% by Weight
Crystalline Silica (Quartz)	14808-60-7	87-99.9

Crystalline silica exists in several forms, the most common of which is quartz. If crystalline silica (quartz) is heated to more than 870°C, it can change to a form of crystalline silica known as trydimite, and if crystalline silica (quartz) is heated to more than 1470°C, it can change to a form of crystalline silica known as cristobalite. The OSHA PEL for crystalline silica as trydimite and cristobalite is one-half of the OSHA PEL for crystalline silica (quartz).

SECTION 3: HAZARD IDENTIFICATION

Emergency Overview: The material is white or tan colored free-flowing sand. High airborne levels of dust may cause irritation to eyes and upper respiratory tract. Crystalline silica is an IARC Group 1 carcinogen. Contact with powerful oxidizing agents such as fluorine, chlorine trifluoride, manganese trioxide, oxygen difluoride, may cause fire. It dissolves in hydrofluoric acid and may produce a corrosive gas (silicon tetrafluoride).

Acute Health Effects:

Inhalation: Excessive exposure to high concentrations of dust may cause irritation to the eyes, skin, and mucous membranes of the upper respiratory tract.

Eye: Dusts may cause irritation to the eye. Scratching of cornea can occur if eye is rubbed.

Ingestion: Ingestion of harmful amounts of this product as distributed is unlikely due to its solid insoluble form. Ingestion of excessive amounts of dust may cause nausea or vomiting.

Chronic Health Effects:

Chronic inhalation of respirable crystalline silica may cause silicosis; a fibrosis (scarring) of the lungs. Silicosis may be progressive; it may lead to disability and death. Crystalline silica inhaled from occupational sources is classified as carcinogenic to humans. There is some evidence that inhalation of respirable crystalline silica or silicosis is associated with an increased incidence of scleroderma (an immune system disorder manifested by

fibrosis of the lungs, skin, and other internal organs), and kidney disease. Silicosis is also reported to increase the risk of tuberculosis. Generally, there are no signs or symptoms of exposure to crystalline silica. The condition of individuals with lung disease (e.g., bronchitis, emphysema, chronic obstructive pulmonary disease) can be aggravated by exposure. *See Section 11, Toxicological Information, for additional detail on potential adverse health effects.*

SECTION 4: FIRST AID MEASURES

Inhalation: If there is a gross inhalation of crystalline silica, remove the person immediately to fresh air. Consult a physician as necessary.

Ingestion: Ingestion may cause gastrointestinal discomfort. Dilute by drinking large quantities of water. If discomfort persists, consult a physician.

Eye Contact: Immediately wash eyes with large amounts of water. If irritation or redness persists consult a physician.

Skin Contact: Wash with soap and water. If irritation persists consult a physician.

SECTION 5: FIRE FIGHTING MEASURES

Crystalline silica (quartz) is not flammable, combustible, or explosive.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Accidental Release: Use personal protective equipment recommended in Section 8. Clean up using dustless methods (water or vacuum) to minimize generation and distribution of respirable silica particles. Avoid using compressed air. Collect material in appropriate containers for recovery and recycling or disposal.

Waste Disposal: See Section 12.

SECTION 7: HANDLING AND STORAGE

Handling: Handle the product in accordance with good industrial hygiene and safety practices. Refer to Section 8 for additional information on personal protective equipment. See American Society of Testing and Materials (ASTM) Standard Practice E 1132-99a, "*Standard Practice for Health Requirements Relating to Occupational Exposure to Respirable Crystalline Silica.*" Do not breathe dust. Use proper work practices and adequate ventilation with dust collection to maintain airborne levels of crystalline silica to below the PEL. *Use of this product may generate elevated levels of crystalline silica dust that may not be visible to the unaided eye.* If the airborne exposure levels to crystalline silica cannot be maintained below the PEL, wear a respirator (see Section 8) when handling, storing, or disposing of this product.

Storage: Avoid breakage of bagged material or spills of bulk material. *Note*: Quartz is incompatible with oxidizers such as hydrofluoric acid, fluorine, chlorine trifluoride, or oxygen difluoride (see Section 10).

The OSHA Hazard Communication Standard 29 CFR 1910.1200 and state and local worker or community "Right to Know" laws and regulations should be strictly followed. *Warn your employees (and your customer users in case of resale) by posting and other means of the hazards and the required OSHA precautions to be used. Provide training about the OSHA precautions.*

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Local Exhaust: Use sufficient local exhaust to reduce the level of respirable crystalline silica to below the PEL. See ACGIH "Industrial Ventilation, A Manual of Recommended Practice" (latest edition). Minimize the collection (build-up) of dust on walls, floors, equipment, and other horizontal surfaces.

Eye Protection: Use safety glasses, goggles, or face shield (as appropriate) under circumstances where particles could cause injury to the eye.

Skin Protection: Good personal hygiene practices should be followed including cleansing of exposed skin with soap and water, and laundering soiled work clothing.

Respiratory Protection: Use a NIOSH-approved air purifying or supplied-air respirator where airborne concentrations of crystalline silica (quartz) are expected to exceed exposure limits (see table below). Appropriate respiratory protection for respirable crystalline silica is based on the airborne exposure concentration and duration of exposure for the particular use of the respirator. A respiratory protection program in accordance with OSHA Standard 29 CFR 1910.134 must be implemented whenever workplace conditions warrant use of a respirator. ANSI Standard Z88.2 (recent revision) "American National Standard for Respiratory Protection." should also be considered. All tight-fitting respirators must be fit-tested either qualitatively or quantitatively for each respirator user. NIOSH recommends the use of respiratory protection when effective engineering controls are not feasible, or while they are being installed to control workplace exposures to crystalline silica.

AIRBORNE CRYSTALLINE SILICA CONCENTRATION	MINIMUM RESPIRATORY PROTECTION
Up to 0.5 mg/m^3	Any air-purifying respirator with a high efficiency particulate air (HEPA) filter.
Up to 1.25 mg/m^3	Any powered, air-purifying, full-facepiece respirator with a HEPA filter. Any supplied-air respirator operated in a continuous-flow mode.
Up to 2.5 mg/m^3	Any powered, air-purifying, full-facepiece respirator with a HEPA filter. Any powered, air-purifying respirator with a tight-fitting facepiece and a HEPA filter.
Up to 25 mg/m^3	Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode.
Emergency or Planned Entry into Unknown Concentrations or Immediately Dangerous to Life or Health (IDLH) Conditions	Up to 500 mg/m^3: Any self-contained breathing apparatus with a full-facepiece and is operated in pressure-demand mode or other positive pressure mode. Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus.
Escape	Any air-purifying, full-facepiece respirator with a HEPA filter. Any appropriate escape-type, self-contained breathing apparatus.
Use only NIOSH-approved respiratory protection. See 29 CFR §1910.134 and 42 CFR §84. See also ANSI standard Z88.2 (latest revision) "American National Standard for Respiratory Protection."	

Exposure Guidelines:

Chemical	Percentage (by wt.)	Exposure Guidelines						Unit
		OSHA		NIOSH		ACGIH		
		TWA	STEL	TWA	STEL	TWA	STEL	
Crystalline Silica (Quartz)	87-99.9	$\frac{10\ mg/m^3\ [a]}{\%\ SiO_2 + 2}$	N.E.	0.05[a]	N.E.	0.05 0.025[b]	N.E.	mg/m^3
N.E. = Not Established. a = respirable dust. b = Notice of Intended Change.								
OSHA Permissible Exposure Limits (PEL) and ACGIH Threshold Limit Values (TLV) are an 8-hour time-weighted average (TWA) concentration during a 40-hour workweek. NIOSH Recommended Exposure Limits (REL) is for up to a 10-hour workday during a 40-hour workweek.								

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Vapor Density (Air = 1): Not applicable.
Specific Gravity (Water = 1): 2.65
Solubility in Water: Insoluble in water.
Vapor Pressure: 10mm @ 1730°C
Melting Point: 1710° C
Boiling Point: 2230° C
Evaporation Rate (Butyl Acetate = 1): None.
Appearance and Color: White to tan; odorless.

SECTION 10: STABILITY AND REACTIVITY

Stability: Stable under normal handling and storage conditions.

Hazardous Polymerization: Cannot occur.

Chemical Incompatibility (Materials to Avoid): Contact with powerful oxidizing agents such as fluorine, chlorine trifluoride, manganese trioxide, oxygen difluoride, may cause fires.

Hazardous Decomposition Products: Crystalline silica will dissolve in hydrofluoric acid and produce a corrosive gas (silicon tetrafluoride).

SECTION 11: TOXICOLOGICAL INFORMATION

Silicosis: The major concern is silicosis, caused by the inhalation and retention of respirable crystalline silica dust. Silicosis can exist in several forms, chronic (or ordinary), accelerated, or acute.

Chronic or Ordinary Silicosis (often referred to as Simple Silicosis) is the most common form of silicosis, and can occur after many years of exposure to relatively low concentrations of airborne respirable crystalline silica dust. It is further defined as either simple or complicated silicosis. Lung lesions (shown as radiographic opacities) less than 1 centimeter in diameter characterize simple silicosis, primarily in the upper lung zones. Often, simple silicosis is not associated with symptoms, detectable changes in lung function or disability. Simple silicosis may be progressive and may develop into complicated silicosis or progressive massive fibrosis (PMF). Complicated silicosis or PMF is characterized by lung lesions (shown as radiographic opacities) greater than 1 centimeter in diameter. Although there may be no symptoms associated with complicated silicosis or PMF, the symptoms, if present, are shortness of breath, wheezing, cough and sputum production. Complicated silicosis or PMF may be associated with decreased lung function and may be disabling. Advanced complicated silicosis or PMF may lead to death. Advanced complicated silicosis or PMF can result in heart disease secondary to the lung disease (cor pumonale).

Accelerated Silicosis can occur with exposure to high concentrations of respirable crystalline silica over a relatively short period; the lung lesions can appear within five years of the initial exposure. The progression can be rapid. Accelerated silicosis is similar to chronic or ordinary silicosis, except that the lung lesions appear earlier and the progression is more rapid.

Acute Silicosis can occur with exposures to very high concentrations of respirable crystalline silica over a very short time period, sometimes as short as a few months. The symptoms of acute silicosis include progressive shortness of breath, fever, cough and weight loss. Acute silicosis can be fatal.

Cancer:

IARC: The International Agency for Research on Cancer ("IARC") concluded that there was *"sufficient evidence* in humans for the carcinogenicity of crystalline silica in the forms of quartz or cristobalite from occupational sources", and that there is *"sufficient evidence* in experimental animals for the carcinogenicity of quartz and cristobalite." The overall IARC evaluation was that "crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is *carcinogenic to humans (Group* 1)." The IARC evaluation noted that "carcinogenicity was not detected in all industrial circumstances studies. Carcinogenicity may be dependent on inherent characteristics of the crystalline silica or on external factors affecting its biological activity or distribution of its polymorphs." For further information on the IARC evaluation, see IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Volume 68, "Silica, Some Silicates..." (1997).

NTP: The National Toxicology Program (NTP), in its Ninth Annual Report on Carcinogens, classified "silica, crystalline (respirable)" as a known human carcinogen.

OSHA: Crystalline silica (quartz) is not regulated as a human carcinogen by the Occupational Safety and Health Administration (OSHA) as a carcinogen.

There have been many articles published on the carcinogenicity of crystalline silica, which the reader should consult for additional information. The following are examples of recently published articles:

"*Crystalline Silica and Lung Cancer: The Problem of Conflicting Evidence*", Indoor Built Environ, Volume 8, pp. 121-126 (1998);

"*Crystalline Silica and the Risk of Lung Cancer on the Potteries*", Occup. Environ. Med., Volume 55, pp. 779-785 (1998);

"*Is Silicosis Required for Silica-Associated Lung Cancer?*" American Journal of Industrial Medicine, Volume 37, pp. 252- 259 (2000);

"*Silica, Silicosis, and Lung Cancer: A Risk Assessment*", American Journal of Industrial Medicine, Volume 38, pp. 8-18 (2000);

"*Silica, Silicosis, and Lung Cancer: A Response to a Recent Working Group Report*", Journal of Occupational and Environmental Medicine, Volume 42, pp. 704-720 (2000).

"*NIOSH Hazard Review: Health Effects of Occupational Exposure to Respirable Crystalline Silica*. DDHS (NIOSH) Publication No. 2002-129 (2002).

Autoimmune Diseases: There is evidence that exposure to respirable crystalline silica (without silicosis) or that the disease silicosis is associated with the increased incidence of several autoimmune disorders, -- scleroderma, systemic lupus erythematosus, rheumatoid arthritis and diseases affecting the kidneys. For a review of the subject, the following may be consulted:

"*Occupational Exposure to Crystalline Silica and Autoimmune Disease*", Environmental Health Perspectives, Volume 107, Supplement 5, pp. 793-802 (1999);

"*Occupational Scleroderma*", Current Opinion in Rheumatology, Volume 11, pp. 490-494 (1999).

Tuberculosis: Individuals with silicosis are at increased risk to develop pulmonary tuberculosis, if exposed to persons with tuberculosis. The following may be consulted for further information:

Occupational Lung Disorders, Third Edition, Chapter 12, entitled "Silicosis and Related Diseases", Parkes, W. Raymond (1994);

"*Risk of pulmonary tuberculosis relative to silicosis and exposure to silica dust in South African gold miners*," Occup. Environ. Med., Volume 55, pp.496-502 (1998).

Kidney Disease: There is evidence that exposure to respirable crystalline silica (without silicosis) or that the disease silicosis is associated with the increased incidence of kidney diseases, including end stage renal disease. For additional information on the subject, the following may be consulted:

"*Kidney Disease and Silicosis*", Nephron, Volume 85, pp. 14-19 (2000).

SECTION 12: DISPOSAL CONSIDERATIONS

General: Disposal of the material should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements. The material should be covered to minimize generation of airborne dust.

RCRA: Crystalline silica (quartz) is not classified as a hazardous waste under the Resource Conservation and Recovery Act, or its regulations, 40 CFR §261 et seq.

The above applies to materials as sold by Best Sand Corporation. The material may be contaminated during use, and it is the responsibility of the user to assess the appropriate disposal of the used material.

SECTION 13: TRANSPORT INFORMATION

Crystalline silica (quartz) is not a hazardous material for purposes of transportation under the U. S. Department of Transportation Table of Hazardous Materials, 49 CFR §172.101.

SECTION 14: REGULATORY INFORMATION

United States (Federal and State):

TSCA: Crystalline silica (quartz) is on the EPA Toxic Substance Control Act (TSCA) Section 8(b) inventory under CAS No. 14808-60-7.

RCRA: Crystalline silica (quartz) is not classified as a hazardous waste under the Resource Conservation and Recovery Act (RCRA), or its regulations, 40 CFR §261 et seq.

CERCLA: Crystalline silica (quartz) is not classified as a hazardous substance under regulations of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), 40 CFR §302.

Emergency Planning and Community Right to Know Act (EPCRA): Crystalline silica (quartz) is not an extremely hazardous substance under Section 302 and is not a toxic chemical subject to the requirements of Section 313.

Clean Air Act: Crystalline silica (quartz) was not processed with or does not contain any Class I or Class II ozone depleting substances.

Clean Water Act: Crystalline silica (quartz) is not listed as a hazardous substance in Section 311.

NTP: Respirable crystalline silica (quartz) is classified as a carcinogen.

OSHA: Crystalline silica (quartz) is listed under 29 CFR 1910.1000 as a toxic and hazardous substance.

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): Crystalline silica (quartz) is classified as a substance known to the State of California to be a carcinogen.

Canada:

Domestic Substances List (DSL): Best Sand Corporation's products, as naturally occurring substances, are on the Canadian DSL.

WHMIS (Workplace Hazardous Materials Information System) Classification: Class D, Division 2A.

Other:

IARC: Crystalline silica (quartz) is classified in IARC Group 1 Carcinogen.

National, state, provincial or local emergency planning, community right-to-know or other laws, regulations or ordinances may be applicable--consult applicable national, state, provincial or local laws.

SECTION 15: OTHER INFORMATION

Web Sites with Information about Effects of Crystalline Exposure:

http://www.osha.gov
http://www.cdc.gov/niosh/silicpag.html

User's Responsibility: The OSHA Hazard Communication Standard 29 CFR 1910.1200 require that this Material Safety Data Sheet be made available to your employees who handle or may be exposed to this product. Educate and train your employees regarding applicable precautions. Instruct your employees to handle this product properly.

Disclaimer: The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for one's own particular use. Since the actual use of the product described herein is beyond our control, Best Sand Corporation assumes no liability arising out of the use of the product by others. Appropriate warnings and safe handling procedures should be provided to handlers and users.

Silica, Lake or Bank Sand

WARNING

Inhalation May Cause Lung Damage

Read Material Safety Data Sheet Before Using Product

Product is not intended for and is strictly prohibited for sandblasting.

This product contains respirable crystalline silica "quartz" (CAS #1408-60-7). Long term or repeated inhalation of respirable crystalline silica can cause fibrosis or scar tissue in the lungs (Silicosis). The International Agency for Research on Cancer (IARC) concluded that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group 1).

For additional information on this product
Refer to the Material Safety Data Sheet or contact:

Best Sand Inc.
2069 N. 3462nd Road
P.O. Box 177
Wedron, IL 60557
(800) 281-9876

6/29/05

Safety (MSDS) data for 4-methyl-2-pentanol

General

Synonyms: isobutyl methyl carbinol, methyl amyl alcohol, MIBC, methyl isobutyl carbinol
Use:
Molecular formula: $(CH_3)_2CHCH_2CH(OH)CH_3$
CAS No: 108-11-2
EINECS No: 203-551-7

Physical data

Appearance: colourless liquid
Melting point: -90 C
Boiling point: 132 C
Vapour density:
Vapour pressure:
Density (g cm^{-3}): 0.802
Flash point:
Explosion limits:
Autoignition temperature:
Water solubility: slight

Stability

Stable. Flammable. Incompatible with oxidizing agents, acids, acid chlorides.

Toxicology

Respiratory, skin and eye irritant.

Toxicity data

(The meaning of any toxicological abbreviations which appear in this section is given here.)

ORL-RAT LD50 2590 mg kg^{-1}
SKN-RBT LD50 3560 mg kg^{-1}

Risk phrases

(The meaning of any risk phrases which appear in this section is given here.)
R10 R36 R37 R38.

Transport information

(The meaning of any UN hazard codes which appear in this section is given here.)
UN No 2282. Packing group III. Hazard code 3.3.

Personal protection

Safety glasses, good ventilation. Keep away from sources of ignition.

Safety phrases

(The meaning of any safety phrases which appear in this section is given here.)
S24 S25.

Material Safety Data Sheet for #2 Diesel

Definition of terms

1. Chemical Product

MSDS Number: U7770

MSDS Date: 01-31-99

Product Name: #2 Diesel Fuel

24 Hour Emergency Phone: (210) 979-8346
Transportation Emergencies: Call Chemtrec at 1-800-424-9300
MSDS Assistance: (210) 592-4593

Distributors Name and Address:

T.W. Brown Oil Co., Inc.
1857 Knoll Drive
Ventura, California 93003

Chemical Name: #2 Diesel Fuel **Cas Number:** 68476-34-6

Synonyms/Common Names: This Material Safety Data Sheet applies to the following product descriptions for Hazard Communication purposes only. Technical specifications vary greatly depending on the product, and are not reflected in this document. Consult specification sheets for technical information.

California Air Resources Board (Carb) Diesel Fuel- On-road, Off-Road, Tax Exempt blends
Premium Diesel Fuel- Low-Sulfur, High-sulfur, On-Road, Off-Road, Tax Exempt blends
#2 Distillate- Low-Sulfur, High-sulfur, On-Road, Off-Road, Tax Exempt blends
#2 Diesel Fuel- Low-Sulfur, High-sulfur, On-Road, Off-Road, Tax Exempt blends
#2 Fuel Oil- Low-Sulfur, High-sulfur, On-Road, Off-Road, Tax Exempt blends

2. Composition, Information On Ingredients

Product Use: This product is intended for use as a fuel in engines and heaters designed for diesel fuels, and for use in engineered processes. Use in other applicatiions may result in higher exposures and require additional controls, such as local exhaust ventilation and personal protective equipment.

Description: #2 Diesel is a complex mixture of hydrocarbons from a variety of chemical processes blended to meet standardized product specifications. Composition varies greatly and includes C9 to C20 hydrocarbons with a boiling range of about 325-675 degrees F. The following is a non-exhaustive list of common components, typical percentage ranges in product, and occupational exposure limits for each.

Material Safety Data Sheet for #2 Diesel

Component or Material Name	%	CAS Number	ACGIH Limits TLV -- STEL -- Units	OSHA Exposure Limits PEL -- STEL -- C/P -- Units
Cat cracked distillate, light	0-100	64741-59-9	100 -- NA -- mg/m3	N/A -- N/A -- N/A -- N/A
Hydrotreated distillate, middle	0-100	64742-46-7	100 -- NA -- mg/m3	N/A -- N/A -- N/A -- N/A
Hydrotreated distillate, light	0-100	64742-47-8	100 -- NA -- mg/m3	N/A -- N/A -- N/A -- N/A
Gas oil, light	0-100	64741-44-2	100 -- NA -- mg/m3	N/A -- N/A -- N/A -- N/A

3. Hazards Identification

Health Hazard Data:

1. The major effect of exposure to this product is giddiness, headache, central nervous system depression; possible irritation of eyes, nose, and lungs; and dermal irritation. Signs of kidney and liver damage may be delayed. Pulmonary irritation secondary to exhalation fo solvent.

2. NIOSH recommends that whole diesel engine exhaust be regarded as a potential occupational carcinogen. Follow OSHA and NSHA rules where diesel engine exhaust fumes may be generated.

3. A life time skin painting study by the American Petroleum Institute has shown that similar naphtha products with a boiling range of 350-700 degrees F usually produce skin tumors and/ or skin cancers in laboratory mice. Only a weak to moderate response occurred. The effect to humans has not been determined.

4. Positive results at 2.0 ml/kg and 6.0 ml/kg noted in mutagenesis studies via in-vivo bone marrow cytogenetics assay in rats.

5. Kerosene is classified as a severe skin irritant. Mutation data has been reported for kerosene products. Hydrotreated kerosene is listed as being probably carcinogenic to humans with limited evidence in humans and sufficient evidence in experimental animals.

Hazards of Combustion Products: Carbon monoxide and carbon dioxide can be found in the combustion products of this product and other forms of hydrocarbon combustion. Carbon monoxide in moderate concentrations can cause symptoms of headache, nausea, vomiting, increased cardiac output, and confusion. Exposure to higher concentrations of carbon monoxide can cause loss of consciousness, heart damage, brain damage, and/or death. Exposure to high concentrations of carbon dioxide can cause simple asphyxiation by displacing available oxygen. Combustion of this and other similar materials should only be carried out in well ventilated areas.

MATERIAL SAFETY DATA SHEET

Hydrogen Peroxide Solutions Greater Than 60%

MSDS Ref. No.: 7722-84-1-5
Date Approved: 11/04/2004
Revision No.: 8

This document has been prepared to meet the requirements of the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200; the Canada's Workplace Hazardous Materials Information System (WHMIS) and, the EC Directive, 2001/58/EC.

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: Hydrogen Peroxide Solutions Greater Than 60%

ALTERNATE PRODUCT NAME(S): Durox® Reg. & LR 70%, Semiconductor Reg. 70%, Standard 60 & 70%, Super D® 65%, Technical 70%

GENERAL USE: Durox® 70% Reg. and LR - meets food chemical codex specifications, when diluted to 50% and lower concentrations with proper quality water, for aseptic packaging and other food related applications.

Standard 60 & 70% - the grade most suitable for industrial bleaching, processing, pollution abatement and general oxidation reactions.

Super D® 65% - meets US Pharmacopoeia specifications for 3% topical solutions when diluted with proper quality water. While manufactured to the USP standards for purity and to FMC's demanding ISO 9002 quality standards, FMC does not claim that its Hydrogen Peroxide is manufactured in accordance with all pharmaceutical cGMP conditions.

Technical 70% - suitable for chemical synthesis (essentially free of inorganic metals).

Semiconductor Reg. 70% - conforms to ACS and semi specs; for wafer etching and cleaning, and applications requiring low residues.

Chlorate Grade 70% - specifically formulated for use in chlorate manufacture or processing.

MANUFACTURER

FMC CORPORATION
Hydrogen Peroxide Division
1735 Market Street
Philadelphia, PA 19103
(215) 299-6000 (General Information)

FMC of Canada Ltd.
Hydrogen Peroxide Division
PG Pulp Mill Road
Prince George, BC V2N2S6
(250) 561-4200 (General Information)

EMERGENCY TELEPHONE NUMBERS

(800) 424-9300 (CHEMTREC - U.S.)
(613) 996-6666 (CANUTEC)
(303) 595-9048 (Medical - U.S. - Call Collect)

(281) 474-8750 (Plant: Pasadena, TX, US - Call Collect)
(250) 561-4221 (Plant: Prince George, BC, Canada - Call Collect)

2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:

- Clear, colorless, odorless liquid
- Oxidizer.
- Contact with combustibles may cause fire.
- Decomposes yielding oxygen that supports combustion of organic matters and can cause overpressure if confined.
- Corrosive to eyes, nose, throat, lungs and gastrointestinal tract.

POTENTIAL HEALTH EFFECTS: Corrosive to eyes, skin, nose, throat and lungs. May cause irreversible tissue damage to the eyes including blindness.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Name	CAS#	Wt.%	EC No.	EC Class
Hydrogen Peroxide	7722-84-1	>60	231-765-0	Xi, R36/38; C, R34; O, R8
Water	7732-18-5	<40	231-791-2	Not classified

4. FIRST AID MEASURES

EYES: Immediately flush with water for at least 15 minutes, lifting the upper and lower eyelids intermittently. See a medical doctor or ophthalmologist immediately.

SKIN: Immediately flush with plenty of water while removing contaminated clothing and/or shoes, and thoroughly wash with soap and water. See a medical doctor immediately.

INGESTION: Rinse mouth with water. Dilute by giving 1 or 2 glasses of water. Do not induce vomiting. Never give anything by mouth to an unconscious person. See a medical doctor immediately.

INHALATION: Remove to fresh air. If breathing difficulty or discomfort occurs and persists, contact a medical doctor.

NOTES TO MEDICAL DOCTOR: Hydrogen peroxide at these concentrations is a strong oxidant. Direct contact with the eye is likely to cause corneal damage especially if not washed immediately. Careful ophthalmologic evaluation is recommended and the possibility of local corticosteroid therapy should be considered. Because of the likelihood of corrosive effects on the gastrointestinal tract after ingestion, and the unlikelihood of systemic effects, attempts at evacuating the stomach via emesis induction or gastric lavage should be avoided. There is a remote possibility, however, that a nasogastric or orogastric tube may be required for the reduction of severe distension due to gas formation.

5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA: Flood with water.

FIRE / EXPLOSION HAZARDS: Product is non-combustible. On decomposition releases oxygen which may intensify fire. An explosion hazard when mixed with organics at high concentrations.

FIRE FIGHTING PROCEDURES: Any tank or container surrounded by fire should be flooded with water for cooling. Wear full protective clothing and self-contained breathing apparatus.

FLAMMABLE LIMITS: Non-combustible

SENSITIVITY TO IMPACT: No data available

SENSITIVITY TO STATIC DISCHARGE: No data available

6. ACCIDENTAL RELEASE MEASURES

RELEASE NOTES: Dilute with a large volume of water and hold in a pond or diked area until hydrogen peroxide decomposes. Hydrogen peroxide may be decomposed by adding sodium metabisulfite or sodium sulfite after diluting to about 5%. Dispose according to methods outlined for waste disposal.

Combustible materials exposed to hydrogen peroxide should be immediately submerged in or rinsed with large amounts of water to ensure that all hydrogen peroxide is removed. Residual hydrogen peroxide that is allowed to dry (upon evaporation hydrogen peroxide can concentrate) on organic materials such as paper, fabrics, cotton, leather, wood or other combustibles can cause the material to ignite and result in a fire.

7. HANDLING AND STORAGE

HANDLING: Wear chemical splash-type monogoggles and full-face shield, impervious clothing, such as rubber, PVC, etc., and rubber or neoprene gloves and shoes. Avoid cotton, wool and leather. Avoid excessive heat and contamination. Contamination may cause decomposition and generation of oxygen gas which could result in high pressures and possible container rupture. Hydrogen peroxide should be stored only in vented containers and transferred only in a prescribed manner (see FMC Technical Bulletins). Never return unused hydrogen peroxide to original container, empty drums should be triple rinsed with water before discarding. Utensils used for handling hydrogen peroxide should only be made of glass, stainless steel, aluminum or plastic.

STORAGE: Store drums in cool areas out of direct sunlight and away from combustibles. For bulk storage refer to FMC Technical Bulletins.

COMMENTS: VENTILATION: Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into the work environment.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMITS

Chemical Name	ACGIH	OSHA	Supplier
Hydrogen Peroxide	1 ppm (TWA)	1 ppm (PEL)	

ENGINEERING CONTROLS: Ventilation should be provided to minimize the release of hydrogen peroxide vapors and mists into the work environment. Spills should be minimized or confined immediately to prevent release into the work area. Remove contaminated clothing immediately and wash before reuse.

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Use chemical splash-type monogoggles and a full-face shield made of polycarbonate, acetate, polycarbonate/acetate, PETG or thermoplastic.

RESPIRATORY: If concentrations in excess of 10 ppm are expected, use NIOSH/DHHS approved self-contained breathing apparatus (SCBA), or other approved atmospheric-supplied respirator (ASR) equipment (e.g., a full-face airline respirator (ALR)). DO NOT use any form of air-purifying respirator (APR) or filtering facepiece (AKA dust mask), especially those containing oxidizable sorbants such as activated carbon.

PROTECTIVE CLOTHING: For body protection wear impervious clothing such as an approved splash protective suit made of SBR Rubber, PVC (PVC Outershell w/Polyester Substrate), Gore-Tex (Polyester trilaminate w/Gore-Tex), or a specialized HAZMAT Splash or Protective Suite (Level A, B, or C). For foot protection, wear approved boots made of NBR, PVC, Polyurethane, or neoprene. Overboots made of Latex or PVC, as well as firefighter boots or specialized HAZMAT boots are also permitted. DO NOT wear any form of boot or overboots made of nylon or nylon blends. DO NOT use cotton, wool or leather, as these materials react RAPIDLY with higher concentrations of hydrogen peroxide. Completely submerge hydrogen peroxide contaminated clothing or other materials in water prior to drying. Residual hydrogen peroxide, if allowed to dry on materials such as paper, fabrics, cotton, leather, wood or other combustibles can cause the material to ignite and result in a fire.

GLOVES: For hand protection, wear approved gloves made of nitrile, PVC, or neoprene. DO NOT use cotton, wool or leather for these materials react RAPIDLY with higher concentrations of hydrogen peroxide. Thoroughly rinse the outside of gloves with water prior to removal. Inspect regularly for leaks.

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9. PHYSICAL AND CHEMICAL PROPERTIES

ODOR:	Odorless
APPEARANCE:	Clear, colorless liquid
AUTOIGNITION TEMPERATURE:	Non-combustible
BOILING POINT:	119°C (246°F) (60%); 126°C (258°F) (70%)
COEFFICIENT OF OIL / WATER:	Not available
DENSITY / WEIGHT PER VOLUME:	(g/mL) Not available
EVAPORATION RATE:	(butyl acetate = 1) Less than water
FLASH POINT:	Non-combustible
FREEZING POINT:	-56°C (-68°F) (60%); -40°C (-40°F) (70%)
ODOR THRESHOLD:	Not available
OXIDIZING PROPERTIES:	Strong oxidizer
PERCENT VOLATILE:	100%
pH:	(as is) < / = 1.0
SOLUBILITY IN WATER:	(in H_2O % by wt) 100%

SPECIFIC GRAVITY:	(H_2O = 1): 1.24 @ 20°C/4°C (60%); 1.29 @ 20°C/4°C (70%)
VAPOR DENSITY:	(Air = 1): Not available
VAPOR PRESSURE:	14.5 mmHg @ 30°C (60%); 10.1 mmHg @ 30°C (70%)

COMMENTS:
pH (1% solution): 5.0 - 6.0

10. STABILITY AND REACTIVITY

CONDITIONS TO AVOID:	Excessive heat or contamination could cause product to become unstable.
STABILITY:	Stable (heat and contamination could cause decomposition)
POLYMERIZATION:	Will not occur
INCOMPATIBLE MATERIALS:	Reducing agents, wood, paper and other combustibles, iron and other heavy metals, copper alloys and caustic.
HAZARDOUS DECOMPOSITION PRODUCTS:	Oxygen which supports combustion.

COMMENTS: Materials to Avoid : Dirt, organics, cyanides and combustibles such as wood, paper, oils, etc.

11. TOXICOLOGICAL INFORMATION

EYE EFFECTS: 70% hydrogen peroxide: Corrosive (rabbit) [FMC Study Number: ICG/T-79.027]

SKIN EFFECTS: 70% hydrogen peroxide: Corrosive. (rabbit) [FMC Study Number: I87-0972]

DERMAL LD_{50}: 70% hydrogen peroxide: > 6.5 g/kg (rabbit) [FMC Study Number: ICG/T-79.027]

ORAL LD_{50}: 70% hydrogen peroxide: 805 mg/kg (rat) [FMC Study Number: I96-2068]

INHALATION LC_{50}: 50% hydrogen peroxide: > 0.17 mg/l (rat) [FMC Study Number: I89-1080]

TARGET ORGANS: Eye, skin, nose, throat, lungs

ACUTE EFFECTS FROM OVEREXPOSURE: Corrosive to eyes, skin, nose, throat, lungs and gastrointestinal tract. May cause irreversible tissue damage to the eyes including blindness.

CHRONIC EFFECTS FROM OVEREXPOSURE: The International Agency for Research on Cancer (IARC) has concluded that there is inadequate evidence for carcinogenicity of hydrogen peroxide in humans, but limited evidence in experimental animals (Group 3 - not classifiable as to its carcinogenicity to humans). The American Conference of Governmental Industrial Hygienists (ACGIH) has concluded that hydrogen peroxide is a 'Confirmed Animal Carcinogen with Unknown Relevance to Humans' (A3).

CARCINOGENICITY:

Chemical Name	IARC	NTP	OSHA	Other
Hydrogen Peroxide	Listed	Not listed	Not listed	(ACGIH) Listed (A3, Animal Carcinogen)

12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL INFORMATION: Channel catfish 96-hour LC_{50} = 37.4 mg/L
Fathead minnow 96-hour LC_{50} = 16.4 mg/L
Daphnia magna 24-hour EC_{50} = 7.7 mg/L
Daphnia pulex 48-hour LC_{50} = 2.4 mg/L
Freshwater snail 96-hour LC_{50} = 17.7 mg/L
For more information refer to ECETOC "Joint Assessment of Commodity Chemicals No. 22, Hydrogen Peroxide." ISSN-0773-6339, January 1993

CHEMICAL FATE INFORMATION: Hydrogen peroxide in the aquatic environment is subject to various reduction or oxidation processes and decomposes into water and oxygen. Hydrogen peroxide half-life in freshwater ranged from 8 hours to 20 days, in air from 10-20 hrs. and in soils from minutes to hours depending upon microbiological activity and metal contaminants.

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: An acceptable method of disposal is to dilute with a large amount of water and allow the hydrogen peroxide to decompose followed by discharge into a suitable treatment system in accordance with all regulatory agencies. The appropriate regulatory agencies should be contacted prior to disposal.

14. TRANSPORT INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION (DOT)

PROPER SHIPPING NAME: Hydrogen Peroxide, aqueous solutions, stabilized with more than 60% hydrogen peroxide.

PRIMARY HAZARD CLASS / DIVISION:	5.1 (Oxidizer)
UN/NA NUMBER:	UN 2015
PACKING GROUP:	I
LABEL(S):	Oxidizer, Corrosive
PLACARD(S):	5.1 (Oxidizer)
ADDITIONAL INFORMATION:	DOT Marking: Hydrogen Peroxide, aqueous solutions, stabilized with more than 60 percent Hydrogen Peroxide, UN 2015 Hazardous Substance/RQ: Not applicable 49 STCC Number: 4918335 DOT Spec: stainless steel/high purity aluminum cargo tanks and rail cars. UN Spec: high purity aluminum drums. Contact FMC for specific details.

INTERNATIONAL MARITIME DANGEROUS GOODS (IMDG)

PROPER SHIPPING NAME:	Hydrogen peroxide, aqueous solutions stabilized with more than 60% hydrogen peroxide.

INTERNATIONAL CIVIL AVIATION ORGANIZATION (ICAO) / INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA)

PROPER SHIPPING NAME:	Hydrogen peroxide greater than 60% is forbidden on Passenger and Cargo Aircraft, as well as Cargo Only Aircraft.

OTHER INFORMATION:

Protect from physical damage. Keep drums in upright position. Drums should not be stacked in transit. Do not store drum on wooden pallets.

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15. REGULATORY INFORMATION

UNITED STATES

SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)

SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355, APPENDIX A):
Hydrogen Peroxide > 52%, RQ: 1000 lbs. Planning Threshold: 10,000 lbs.

SECTION 311 HAZARD CATEGORIES (40 CFR 370):
Fire Hazard, Immediate (Acute) Health Hazard

SECTION 312 THRESHOLD PLANNING QUANTITY (40 CFR 370):

The Threshold Planning Quantity (TPQ) for this product, if treated as a mixture, is 10,000 lbs; however, this product contains the following ingredients with a TPQ of less than 10,000 lbs.: (hydrogen peroxide, 1000 lbs. when conc is >52%)

SECTION 313 REPORTABLE INGREDIENTS (40 CFR 372):

Not listed

CERCLA (COMPREHENSIVE ENVIRONMENTAL RESPONSE COMPENSATION AND LIABILITY ACT)

CERCLA DESIGNATION & REPORTABLE QUANTITIES (RQ) (40 CFR 302.4):

Not listed
Unlisted (Hydrogen Peroxide); RQ = 100 lbs.; Ignitability, Corrosivity

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

RCRA IDENTIFICATION OF HAZARDOUS WASTE (40 CFR 261):

Waste Number: D001, D002

CANADA

WHMIS (WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM):

Product Identification Number:	2015
Hazard Classification / Division:	Class C (Oxidizer), Class D, Div. 2, Subdiv. B (Toxic), Class E (Corrosive)
Ingredient Disclosure List:	Listed

EU EINECS NUMBERS:

008-003-00-9 (hydrogen peroxide)

INTERNATIONAL LISTINGS

Hydrogen peroxide:
China: Listed
Japan (ENCS): (1)-419
Korea: KE-20204
Philippines (PICCS): Listed

HAZARD, RISK AND SAFETY PHRASE DESCRIPTIONS:

Hydrogen Peroxide:

EC Symbols:	C	(Corrosive)
	O	(Oxidizer)

EC Risk Phrases:	R34	(Causes burns)
	R8	(Contact with combustible material may cause fire)
EC Safety Phrases:	S1/2	(Keep locked up and out of reach of children.)
	S3	(Keep in a cool place.)
	S28	(After contact with skin, wash immediately with plenty of water and soap.)
	S36/39	(Wear suitable protective clothing. Wear eye / face protection.)
	S45	(In case of accident or if you feel unwell, seek medical advice immediately - show the label where possible.)

16. OTHER INFORMATION

HMIS

Health	3
Flammability	0
Physical Hazard	3
Personal Protection (PPE)	H

Protection = H (Safety goggles, gloves, apron, the use of a supplied air or SCBA respirator is required in lieu of a vapor cartridge respirator)

HMIS = Hazardous Materials Identification System

Degree of Hazard Code:
4 = Severe
3 = Serious
2 = Moderate
1 = Slight
0 = Minimal

NFPA

Health	3
Flammability	0
Reactivity	3
Special	OX

SPECIAL = OX (Oxidizer)

NFPA = National Fire Protection Association

Degree of Hazard Code:
4 = Extreme
3 = High
2 = Moderate
1 = Slight
0 = Insignificant

REVISION SUMMARY:
This MSDS replaces Revision #7, dated February 02, 2004.
Changes in information are as follows:
Section 9 (Physical and Chemical Properties)

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MSDS Number: **A6048** * * * * * *Effective Date:* ***07/21/04*** * * * * * *Supercedes:* ***11/02/01***

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.

AMMONIUM NITRATE

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1. Product Identification

Synonyms: Nitric acid, ammonium salt
CAS No.: 6484-52-2
Molecular Weight: 80.04
Chemical Formula: NH4NO3
Product Codes:
J.T. Baker: 0729, 0731
Mallinckrodt: 3436

---

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Ammonium Nitrate	6484-52-2	99 - 100%	Yes

---

3. Hazards Identification

Emergency Overview

DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE OR EXPLOSION. MAY BE HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.

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

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

Potential Health Effects

Inhalation:
May cause irritation to the respiratory tract; symptoms may include coughing, sore throat, and shortness of breath. At high temperatures, exposure to toxic nitrogen oxides decomposition products can quickly cause acute respiratory problems. Inhalation of large amounts causes systemic acidosis and abnormal hemoglobin.

Ingestion:
Large oral doses of nitrates may cause dizziness, abdominal pain, vomiting, bloody diarrhea, weakness, convulsions, and collapse. Harmful if swallowed. May cause methemoglobinemia resulting in cyanosis.

Skin Contact:
Causes irritation to skin. Symptoms include redness, itching, and pain.

Eye Contact:
Causes irritation, redness, and pain.

Chronic Exposure:
Small repeated oral doses of nitrates may cause weakness, depression, headache, and mental impairment.

Aggravation of Pre-existing Conditions:
No information found.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. Get medical attention for any breathing difficulty.
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:
Remove any contaminated clothing. Wash skin with soap and water for at least 15 minutes. Get medical attention if irritation develops or persists.
Eye Contact:
Wash thoroughly with running water. Get medical advice if irritation develops.

---

5. Fire Fighting Measures

Fire:
Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition. May support combustion in an existing fire.
Explosion:
Contact with oxidizable substances may cause extremely violent combustion. Sealed containers may rupture when heated. Sensitive to mechanical impact.
Fire Extinguishing Media:
Use flooding amounts of water in early stages of fire involving ammonium nitrate. Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

---

6. Accidental Release Measures

Remove sources of heat and ignition.
Collected waste may be transferred to a closed, preferably metal, container and sent to a RCRA approved waste disposal facility.
Alternatively, sweep spill into noncombustible container and dissolve in large amount of water. Add soda ash. Mix and neutralize with 6M-HCl. Neutralized sludge may be sent to an approved waste disposal facility.

---

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Protect against physical damage. Store in a dry location separate from combustible, organic or other readily oxidizable materials. Avoid storage on wood floors. Remove and dispose of any spilled dichromates; do not return to original containers. Do not store above 54C (130F) preferably below 30C (86F). 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. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
Colorless crystals.
Odor:
Odorless.
Solubility:
118g/100g water @ 0C (32F).
Specific Gravity:
1.73 @ 23C (77F)
pH:
5.4

% Volatiles by volume @ 21C (70F):
0
Boiling Point:
210C (410F) Decomposes.
Melting Point:
170C (338F)
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.
Hazardous Decomposition Products:
Emits nitrous oxides when heated to decomposition. Liberates ammonia in reaction with strong alkalis.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Aluminum, antimony, chromium, copper, iron, lead, magnesium, manganese, nickel, zinc, brass, oil, charcoal, organic material, acetic acid, ammonium chloride, bismuth, cadmium, chlorides, cobalt, phosphorus, potassium and ammonium sulfate, sodium, sodium hypochlorite, sodium perchlorate, sodium-potassium alloy, and sulfure.
Conditions to Avoid:
Heat, flame, ignition sources, dusting and incompatibles. Moisture and combustible materials. Shock sensitive.

---

11. Toxicological Information

Oral rat LD50: 2217 mg/kg.

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

Ingredient	NTP Carcinogen - Known	NTP Carcinogen - Anticipated	IARC Category
Ammonium Nitrate (6484-52-2)	No	No	None

---

12. Ecological Information

Environmental Fate:
When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is not expected to evaporate significantly. When released into water, this material is expected to readily biodegrade.
Environmental Toxicity:
No information found.

---

13. Disposal Considerations

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

---

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: AMMONIUM NITRATE
Hazard Class: 5.1
UN/NA: UN1942
Packing Group: III
Information reported for product/size: 300LB

International (Water, I.M.O.)

Proper Shipping Name: AMMONIUM NITRATE
Hazard Class: 5.1
UN/NA: UN1942
Packing Group: III
Information reported for product/size: 300LB

---

15. Regulatory Information

```
  --------\Chemical Inventory Status - Part 1\------------------------
--------
  Ingredient                                        TSCA  EC   Japan
Australia
```

```
  ---------------------------------------------  ----  ---  -----  --
-------
  Ammonium Nitrate (6484-52-2)                    Yes  Yes   Yes
Yes

  --------\Chemical Inventory Status - Part 2\-------------------------
--------
                                                          --Canada--
  Ingredient                                       Korea  DSL   NDSL
Phil.
  ---------------------------------------------  -----  ---   ----  -
----
  Ammonium Nitrate (6484-52-2)                     Yes   Yes   No
Yes

  --------\Federal, State & International Regulations - Part 1\--------
--------
                                           -SARA 302-    ------SARA
313------
  Ingredient                               RQ    TPQ     List
Chemical Catg.
  ---------------------------------------  ---   -----   ----  ------
--------
  Ammonium Nitrate (6484-52-2)             No    No      No
Nitrate cmpd

  --------\Federal, State & International Regulations - Part 2\--------
--------
                                                        -RCRA-    -
TSCA-
  Ingredient                               CERCLA     261.33     8(d)
  ---------------------------------------  ------     ------    -----
-
  Ammonium Nitrate (6484-52-2)             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: Yes         (Pure / Solid)
```

Australian Hazchem Code: 1[S]
Poison Schedule: None allocated.
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: **0** Flammability: **0** Reactivity: **3** Other: **Oxidizer**
Label Hazard Warning:
DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY

CAUSE FIRE OR EXPLOSION. MAY BE HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.

Label Precautions:

Keep from contact with clothing and other combustible materials.
Do not store near combustible materials.
Store in a tightly closed container.
Avoid breathing dust.
Avoid contact with eyes, skin and clothing.
Remove and wash contaminated clothing promptly.
Use only with adequate ventilation.
Wash thoroughly after handling.
Store preferably below 30C

Label First Aid:

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

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 3, 16.

Disclaimer:

4. FIRST AID MEASURES

Ingestion:
If swallowed, call a physician immediately. Only induce vomiting at the instruction of a physician. Never give anything by mouth to an unconscious person.

Skin Contact:
Remove contaminated clothing and shoes without delay. Wash immediately with plenty of water. Do not reuse contaminated clothing without laundering. Get medical attention if pain or irritation persists after washing or if signs and symptoms of overexposure appear.

Eye Contact:
Rinse immediately with plenty of water for at least 15 minutes. Obtain medical attention immediately.

Inhalation:
Material is not expected to be harmful if inhaled. Remove to fresh air.

5. FIRE-FIGHTING MEASURES

Extinguishing Media:	Use water spray, carbon dioxide or dry chemical.
Protective Equipment:	Firefighters, and others exposed, wear self-contained breathing apparatus. Wear full firefighting protective clothing. See MSDS Section 8 (Exposure Controls/Personal Protection).
Special Hazards:	Keep containers cool by spraying with water if exposed to fire.
Mechanical/Static Sensitivity Statements:	None

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions:
Where exposure level is known, wear approved respirator suitable for level of exposure. Where exposure level is not known, wear approved, positive pressure, self-contained respirator. In addition to the protective clothing/equipment in Section 8 (Exposure Controls/Personal Protection), wear impermeable boots.

Methods For Cleaning Up:
Cover spills with some inert absorbent material; sweep up and place in a waste disposal container. Flush spill area with water.

7. HANDLING AND STORAGE

HANDLING

Precautionary Measures: Do not get in eyes, on skin or on clothing. Wash thoroughly after handling.

Handling Statements: None

STORAGE
None

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Measures:
Utilize a closed system process where feasible. Where this material is not used in a closed system, good enclosure and local exhaust ventilation should be provided to control exposure.

Respiratory Protection:
For operations where inhalation exposure can occur, use an approved respirator recommended by an industrial hygienist after an evaluation of the operation. Where inhalation exposure can not occur, no respiratory protection is required. A full facepiece respirator also provides eye and face protection.

Eye Protection:
Prevent eye and skin contact. Provide eye wash fountain and safety shower in close proximity to points of potential exposure. Wear eye/face protection such as chemical splash proof goggles or face shield.

Skin Protection:
Prevent contamination of skin or clothing when removing protective equipment. Wear impermeable gloves and suitable protective clothing.

Additional Advice:
Food, beverages, and tobacco products should not be carried, stored, or consumed where this material is in use. Before eating, drinking, or smoking, wash face and hands thoroughly with soap and water.

---

9. PHYSICAL AND CHEMICAL PROPERTIES

Color:	yellowish
Appearance:	liquid
Odor:	odorless
Boiling Point:	106 °C 223 °F
Melting Point:	-5 - 0 °C 23 - 32 °F (crystallization point)
Vapor Pressure:	17.5mm Hg @ 20 °C (value for water)
Specific Gravity:	1.14 @ 24 °C
Vapor Density:	Not applicable
Percent Volatile (By Wt.):	~50(water)
pH:	Slightly alkaline
Saturation In Air (% By Vol.):	Not applicable
Evaporation Rate:	Not applicable
Solubility In Water:	Complete
Volatile Organic Content:	Not Applicable
Flash Point:	>93 °C 200 °F Pensky-Martens Closed Cup
Flammable Limits (% By Vol):	Not applicable
Autoignition Temperature:	437 °C 819 °F
Decomposition Temperature:	>350 °C 662 °F
Partition coefficient (n-octanol/water):	Not applicable
Odor Threshold:	See Section 2 for exposure limits.

---

10. STABILITY AND REACTIVITY

Stability:	Stable
Conditions To Avoid:	None known
Polymerization:	Will not occur
Conditions To Avoid:	None known
Materials To Avoid:	Strong mineral acids and strong oxidizing agents.

Hazardous Decomposition Products:	oxides of carbon oxides of phosphorus oxides of sulfur (includes sulfur di and tri oxides)

11. TOXICOLOGICAL INFORMATION

Toxicological information for the product is found under Section 3. HAZARDS IDENTIFICATION.
Toxicological information on the regulated components of this product is as follows:

Sodium diisobutyldithiophosphinate may cause severe eye and moderate skin irritation.

12. ECOLOGICAL INFORMATION

This material is readily biodegradable.
This material is not classified as dangerous for the environment.

ALGAE TEST RESULTS

Test: Growth Inhibition (OECD 201)
Duration: 96 hr
Species: Green Algae (Selenastrum capricornutum)

35.1 mg/l	EbC50
115 mg/l	ErC50

FISH TEST RESULTS

Test: Acute toxicity, freshwater (OECD 203)
Duration: 96 hr.
Species: Bluegill Sunfish (Lepomis macrochirus)

375 mg/l	LC50

INVERTEBRATE TEST RESULTS

Test: Acute Immobilization (OECD 202)
Duration: 48 hr
Species: Water Flea (Daphnia magna)

149 mg/l	EC50

DEGRADATION

Test: Closed Bottle (OECD 301D)
Duration: 28 day **Procedure:** Ready biodegradability
78.8 %

13. DISPOSAL CONSIDERATIONS

Cytec encourages the recycle, recovery and reuse of materials, where permitted, as an alternative to disposal as a waste. Cytec recommends that organic materials classified as hazardous waste according to the relevant local or national regulations be disposed of by thermal treatment or incineration at approved facilities. All local and national regulations should be followed.

14. TRANSPORT INFORMATION

This section provides basic shipping classification information. Refer to appropriate transportation regulations for specific requirements.

US DOT

Proper Shipping Name: Not applicable/Not regulated
Hazardous Substances:
Not applicable

TRANSPORT CANADA

Proper Shipping Name: Not applicable/Not regulated

ICAO / IATA

Proper Shipping Name: Not applicable/Not regulated
Packing Instructions/Maximum Net Quantity Per Package:
Passenger Aircraft: -
Cargo Aircraft: -

IMO

Proper Shipping Name: Not applicable/Not regulated

15. REGULATORY INFORMATION

This product has been classified in accordance with the hazard criteria of the Controlled products Regulations and this Material Safety Data Sheet contains all the information required by the Controlled Products Regulations.

WHMIS CLASSIFICATION:
Class D2B Toxic

INVENTORY INFORMATION

United States (USA): All components of this product are included on the TSCA Inventory in compliance with the Toxic Substances Control Act, 15 U. S. C. 2601 et. seq.

Canada: Components of this product have been reported to Environment Canada in accordance with Sections 66 and/or 81 of the Canadian Environmental Protection Act (1999), and are included on the Domestic Substances List.

European Union (EU): All components of this product are included in the European Inventory of Existing Chemical Substances (EINECS) in compliance with Council Directive 67/548/EEC and its amendments.

Australia: All components of this product are included in the Australian Inventory of Chemical Substances (AICS).

China: All components of this product are included on the Chinese inventory or are not required to be listed on the Chinese inventory.

Korea: All components of this product are NOT included on the Korean (ECL) inventory.

16. OTHER INFORMATION

NFPA Hazard Rating (National Fire Protection Association)

Health: 3 - Materials that, under emergency conditions, can cause serious or permanent injury.

Fire: 1 - Materials that must be preheated before ignition can occur.

Reactivity: 0 - Materials that in themselves are normally stable, even under fire exposure conditions.

Reasons For Issue: Revised Section 15

Prepared By: Randy Deskin, Ph.D., DABT +1-973-357-3100

Envirotrol Inc.®Emergency Phone Number:

P.O. Box 61724.827.8181
432 Green St.
Sewickley, PA 15143
Phone: 412.741.2030 Fax: 412.741.2670

MSDS Date: 5/14/2003

Material Safety Data Sheet

Section 1 – Product Identification

Chemical Name: Carbon Trade Name: Activated/Reactivated Carbon (Granular, Pelletized or Powdered)

Formula: _____ Common Name: C a r b o n

CAS Number: 7440-44-0 Chemical Family: Element, Group IV-A

Section 2 – Ingredients (Typical Values)

Carbon	90-100%
Inert Ingredients	0-10%

Section 3 - Physical And Chemical Data

Boiling Point:	8721° F, 4827° C (Approx.)	Vapor Pressure:	N/A
Vapor Density:	N/A	Solubility in Water:	Insoluble
Specific Gravity:	0.2 – 0.75	Percent, Volatile by Volume:	N/A
Appearance:	Black, Odorless, Pelletized, Powder	Evaporation Rate:	N/A

Section 4 - Fire And Explosion Hazard Data

- Flash Point: N / A
- Ignition Point: 500-800° F
- Extinguishing Media: Dry Chemical, Water Fog, Foam
- Special Fire Fighting Procedures: Wear positive pressure self-contained breathing apparatus if fire occurs in enclosed space. Oxygen starved fires may result in the release of carbon monoxide.
- Unusual Fires And Explosion Hazards: Avoid producing suspensions of dust during handling, and avoid exposure of suspensions to sources of ignition. Suspensions of -40 mesh powdered activated carbon may explode if exposed to strong sources of ignition

Section 5 - Health Hazard Data

- Eye: Carbon particles may cause physical irritation if not removed.
- Skin Contact: Constant prolonged exposure may cause dryness or chapping of exposed area
- Skin Adsorption: Not adsorbed by skin.
- Ingestion: No adverse affect unless quantity ingested causes physical discomfort.
- Inhalation: No toxic affect caused by dust. As with any dust, excessive exposure should be avoided. OSHA "Nuisance Dust" limitations should be observed
- Systemic And Other Effects: None

432 Green St.
Sewickley, PA 15143
Phone: 412.741.2030 Fax: 412.741.2670

MSDS Date: 5/14/2003

Section 5 - Health Hazard Data *(continued)*

- Eyes: Irrigate with water immediately. Repeat as needed to flush particle from eye. If irritation persists, consult medical personnel.
- Skin: Wash with soap and water to avoid skin drying or chapping.
- Ingestion: N/A
- Inhalation: N/A

Section 6 - Reactivity Data Compatibility Data

- Stability: Avoid contact with strong oxidizing chemicals, such as ozone, perchloric acid, permanganate, sodium chlorite, etc. Exposure to hydrocarbons and vegetable oils may cause slow oxidation until ignition point is reached--contact should be avoided.
- Incompatibility: Strong oxidizing materials.
- Hazardous Decomposition Products: Oxygen starved combustion may yield carbon monoxide.
- Hazardous Polymerization: Will not occur.

Section 7 - Storage Handling And Use

- Action To Take For Spills: Shovel and sweep material into appropriate container. If necessary wash area with water.
- Disposal Method: Reactivation, landfill or incineration, in accordance with applicable regulations.

Section 8 - Personnel Protection

- Ventilation: Local exhaust recommended minimizing dust exposure.
- Respiratory Protection: Approved "nuisance dust" dust masks should be worn in dust exposure areas.
- Protective Clothing: Protective gloves can be worn.
- Eye Protection: Safety glasses with side shields should be worn and eye wash capabilities should be available.

Section 9 - Special Precautions And Additional Information

Precautions to be taken in handling and storage: keep dry; wet carbon will adsorb oxygen and may reduce oxygen levels in confined spaces to dangerous levels. Adequate ventilation and precautions should be employed whenever closed tanks, receptacles or other enclosed spaces containing carbon are accessed. Suspensions of dust should be avoided and exposure of suspensions of dust to sources of ignition should be avoided.

APPENDIX B

International Cyanide Management Code

INTERNATIONAL CYANIDE MANAGEMENT INSTITUTE

The International Cyanide Management Code

www.cyanidecode.org

July 2005

The International Cyanide Management Code (hereinafter "the Code") and other documents or information sources referenced at *www.cyanidecode.org* are believed to be reliable and were prepared in good faith from information reasonably available to the drafters. However, no guarantee is made as to the accuracy or completeness of any of these other documents or information sources. No guarantee is made in connection with the application of the Code, the additional documents available or the referenced materials to prevent hazards, accidents, incidents, or injury to employees and/or members of the public at any specific site where gold is extracted from ore by the cyanidation process. Compliance with this Code is not intended to and does not replace, contravene or otherwise alter the requirements of any specific national, state or local governmental statutes, laws, regulations, ordinances, or other requirements regarding the matters included herein. Compliance with this Code is entirely voluntary and is neither intended nor does it create, establish, or recognize any legally enforceable obligations or rights on the part of its signatories, supporters or any other parties.

SCOPE

The Code is a voluntary initiative for the gold mining industry and the producers and transporters of the cyanide used in gold mining. It is intended to complement an operation's existing regulatory requirements. Compliance with the rules, regulations and laws of the applicable political jurisdiction is necessary; this Code is not intended to contravene such laws.

The Code focuses exclusively on the safe management of cyanide that is produced, transported and used for the recovery of gold, and on cyanidation mill tailings and leach solutions. The Code originally was developed for gold mining operations, and addresses production, transport, storage, and use of cyanide and the decommissioning of cyanide facilities. It also includes requirements related to financial assurance, accident prevention, emergency response, training, public reporting, stakeholder involvement and verification procedures. Cyanide producers and transporters are subject to the applicable portions of the Code identified in their respective Verification Protocols.

It does not address all safety or environmental activities that may be present at gold mining operations such as the design and construction of tailings impoundments or long-term closure and rehabilitation of mining operations.

The term "cyanide" used throughout the Code generically refers to the cyanide ion, hydrogen cyanide, as well as salts and complexes of cyanide with a variety of metals in solids and solutions. It must be noted that the risks posed by the various forms of cyanide are dependent on the specific species and concentration. Information regarding the different chemical forms of cyanide is found at *www.cyanidecode.org/library/cyanide facts/cyanide chemistry*.

CODE IMPLEMENTATION

As it applies to gold mining operations, the Code is comprised of two major elements. The Principles broadly state commitments that signatories make to manage cyanide in a responsible manner. Standards of Practice follow each Principle, identifying the performance goals and objectives that must be met to comply with the Principle. The Principles and Practices applicable to cyanide production and transportation operations are included in their respective Verification Protocols. Operations are certified as being in compliance with the Code upon an independent third-party audit verifying that they meet the Standards of Practice, Production Practice or Transport Practice.

For implementation guidance, visit *http://www.cyanidecode.org/library/impl_resources.html*.

The programs and procedures identified by the Code's Principles and Standards of Practice and in the Cyanide Production and Transportation Verification Protocols for the management of cyanide can be developed separately from other programs, or they can be integrated into a site's overall safety, health and environmental management programs. Since operations typically do not have direct control over all phases of cyanide production, transport or handling, gold mines that are undergoing Verification Audits for certification under the Code will need to require that other entities involved in these activities and that are not themselves Code signatories commit to

and demonstrate that they adhere to the Code's Principles and meet its Standards of Practice for these activities.

This Code, the implementation guidance, mine operators guide, and other documents or information sources referenced at *www.cyanidecode.org* are believed to be reliable and were prepared in good faith from information reasonably available to the drafters. However, no guarantee is made as to the accuracy or completeness of any of these other documents or information sources. The implementation guidance, mine operators guide, and the additional documents and references are not intended to be part of the Code. No guarantee is made in connection with the application of the Code, the additional documents available or the referenced materials to prevent hazards, accidents, incidents, or injury to employees and/or members of the public at any specific site where gold is extracted from ore by the cyanidation process. Compliance with this Code is not intended to and does not replace, contravene or otherwise alter the requirements of any specific national, state or local governmental statutes, laws, regulations, ordinances, or other requirements regarding the matters included herein. Compliance with this Code is entirely voluntary and is neither intended nor does it create, establish, or recognize any legally enforceable obligations or rights on the part of its signatories, supporters or any other parties.

PRINCIPLES AND STANDARDS OF PRACTICE

1. PRODUCTION **Encourage responsible cyanide manufacturing by purchasing from manufacturers who operate in a safe and environmentally protective manner.**

Standard of Practice

1.1 Purchase cyanide from manufacturers employing appropriate practices and procedures to limit exposure of their workforce to cyanide and to prevent releases of cyanide to the environment.

2. TRANSPORTATION **Protect communities and the environment during cyanide transport.**

Standards of Practice

2.1 Establish clear lines of responsibility for safety, security, release prevention, training and emergency response in written agreements with producers, distributors and transporters.

2.2 Require that cyanide transporters implement appropriate emergency response plans and capabilities, and employ adequate measures for cyanide management.

3. HANDLING AND STORAGE **Protect workers and the environment during cyanide handling and storage.**

Standards of Practice

3.1 Design and construct unloading, storage and mixing facilities consistent with sound, accepted engineering practices and quality control and quality assurance procedures, spill prevention and spill containment measures.

3.2 Operate unloading, storage and mixing facilities using inspections, preventive maintenance and contingency plans to prevent or contain releases and control and respond to worker exposures.

4. OPERATIONS Manage cyanide process solutions and waste streams to protect human health and the environment.

Standards of Practice

4.1 Implement management and operating systems designed to protect human health and the environment including contingency planning and inspection and preventive maintenance procedures.

4.2 Introduce management and operating systems to minimize cyanide use, thereby limiting concentrations of cyanide in mill tailings.

4.3 Implement a comprehensive water management program to protect against unintentional releases.

4.4 Implement measures to protect birds, other wildlife and livestock from adverse effects of cyanide process solutions.

4.5 Implement measures to protect fish and wildlife from direct and indirect discharges of cyanide process solutions to surface water.

4.6 Implement measures designed to manage seepage from cyanide facilities to protect the beneficial uses of ground water.

4.7 Provide spill prevention or containment measures for process tanks and pipelines.

4.8 Implement quality control/quality assurance procedures to confirm that cyanide facilities are constructed according to accepted engineering standards and specifications.

4.9 Implement monitoring programs to evaluate the effects of cyanide use on wildlife, surface and ground water quality.

5. DECOMMISSIONING **Protect communities and the environment from cyanide through development and implementation of decommissioning plans for cyanide facilities.**

Standards of Practice

5.1 Plan and implement procedures for effective decommissioning of cyanide facilities to protect human health, wildlife and livestock.

5.2 Establish an assurance mechanism capable of fully funding cyanide-related decommissioning activities.

6. WORKER SAFETY **Protect workers' health and safety from exposure to cyanide.**

Standards of Practice

6.1 Identify potential cyanide exposure scenarios and take measures as necessary to eliminate, reduce and control them.

6.2 Operate and monitor cyanide facilities to protect worker health and safety and periodically evaluate the effectiveness of health and safety measures.

6.3 Develop and implement emergency response plans and procedures to respond to worker exposure to cyanide.

7. EMERGENCY RESPONSE **Protect communities and the environment through the development of emergency response strategies and capabilities.**

Standards of Practice

7.1 Prepare detailed emergency response plans for potential cyanide releases.

7.2 Involve site personnel and stakeholders in the planning process.

7.3 Designate appropriate personnel and commit necessary equipment and resources for emergency response.

7.4 Develop procedures for internal and external emergency notification and reporting.

7.5 Incorporate into response plans monitoring elements and remediation measures that account for the additional hazards of using cyanide treatment chemicals.

7.6 Periodically evaluate response procedures and capabilities and revise them as needed.

8. TRAINING **Train workers and emergency response personnel to manage cyanide in a safe and environmentally protective manner.**

Standards of Practice

8.1 Train workers to understand the hazards associated with cyanide use.

8.2 Train appropriate personnel to operate the facility according to systems and procedures that protect human health, the community and the environment.

8.3 Train appropriate workers and personnel to respond to worker exposures and environmental releases of cyanide.

9. DIALOGUE **Engage in public consultation and disclosure.**

Standards of Practice

9.1 Provide stakeholders the opportunity to communicate issues of concern.

9.2 Initiate dialogue describing cyanide management procedures and responsively address identified concerns.

9.3 Make appropriate operational and environmental information regarding cyanide available to stakeholders.

CODE MANAGEMENT

Administration

The International Cyanide Management Institute ("The Institute") is a non-profit corporation established to administer the Code through a multi- stakeholder Board of Directors consisting of representatives of the gold mining industry and participants from other stakeholder groups. For additional information on the Institute, see: www.cyanidecode.org/theinstitute.

The Institute's primary responsibilities are to:

- Promote adoption of and compliance with the Code, and to monitor its effectiveness and implementation within the world gold mining industry.
- Develop funding sources and support for Institute activities.
- Work with governments, NGOs, financial interests and others to foster widespread adoption and support of the Code.
- Identify technical or administrative problems or deficiencies that may exist with Code implementation, and
- Determine when and how the Code should be revised and updated.

Code Signatories

Gold mining companies with either single or multiple operations, and the producers and transporters of cyanide used in gold mining can become signatories to the Code; the signature of an owner or corporate officer of the operating company is required. By becoming a signatory, a company commits to follow the Code's Principles and implement its Standards of Practice, or in the case of producers and transporters, the Principles and Practices identified in their respective Verification Protocols. Code signatories' operations will be audited to verify their operation's compliance with the Code.

When becoming a signatory, a gold mining company must specify which of its operations it intends on having certified. Only those cyanide production and transportation facilities that are related to the use of cyanide in gold mining are subject to certification. A company that does not have these operations audited within 3 years of signing the Code will lose its signatory status. See: www.cyanidecode.org/signatories&certifiedoperations.

Code Verification and Certification

Audits are conducted every three years by independent, third-party professionals who meet the Institute's criteria for auditors. Auditors evaluate an operation to determine if its management of cyanide achieves the Code's Principles and Standards of Practice, or the Production or Transport Practices for these types of operations. The Code's Verification Protocols contains the criteria for all audits. Operations must make all relevant data available to the auditors, including the complete findings of their most recent independent Code Verification Audit, in order to be considered for certification.

During an initial verification audit, an operation's compliance at the time of the audit will be evaluated. Subsequent re-verification audits will also evaluate compliance during the period between the preceding and current audits.

Upon completion of the audit, the auditor must review the findings with the operation to ensure that the audit is factually accurate and make any necessary changes. The auditor must submit a detailed "Audit Findings Report" addressing the criteria in the Verification Protocol and a "Summary Audit Report" that includes the conclusion regarding the operation's compliance with the Code to the signatory, the operation and to the Institute. The operation is certified as complying with the Code if the auditor concludes that it is in full compliance with the Code's Principles and Standards of Practice or its Principles and Practices for cyanide production or transportation. The detailed "Audit Findings Report" is the confidential property of the operation and shall not be released by the Institute in any fashion without the express written consent of the signatory and audited operation. The "Summary Audit Report" of certified operations will be made available to the public on the Code website. The operation may submit its comments regarding the Summary Audit Report to the Institute, which will be posted along with the Summary Audit Report on the Institute's website.

Operations that are in substantial compliance with the Code are conditionally certified, subject to the successful implementation of an Action Plan. Substantial compliance means that the operation has made a good-faith effort to comply with the Code and that the deficiencies identified by the auditor can be readily corrected and do not present an immediate or substantial risk to employee or community health or the environment. Operations that are in substantial compliance with a Standard of Practice, Production Practice or Transport Practice must develop and implement an Action Plan to correct the deficiencies identified by the verification audit. The operation may request that the auditor review the Action Plan or assist in its development so that there is agreement that its implementation will bring the operation into full compliance. The Action Plan must include a time period mutually agreed to with the auditor, but in no case longer than one year, to bring the operation into full compliance with the Code. The Auditor must submit the Action Plan to the Institute along with the Audit Findings Report and Summary Audit Report.

The operation must provide evidence to the auditor demonstrating that it has implemented the Action Plan as specified and in the agreed-upon time frame. In some cases, it may be necessary for the auditor to re-evaluate the operation to confirm that the Action Plan has been implemented. Upon receipt of the documentation that the Action Plan has been fully implemented, the auditor must provide a copy of the documentation to the Institute along with a statement verifying that the operation is in full compliance with the Code.

All operations certified as in compliance with the Code will be identified on the Code website, *www.cyanidecode.org/signatories&certifiedoperations*. Each certified operation's Summary Audit Report will be posted and operations with conditional certification will have their Summary Audit Report and their Action Plan posted.

An operation cannot be certified if the auditor concludes that it is neither in full compliance nor in substantial compliance with any one of the Standards of Practice (or Production or Transport Practice). An operation that is not certified based on its initial verification audit can be verified and certified once it has brought its management programs and procedures into compliance with the Code. Its signatory parent company remains a signatory during this process.

A gold mining operation that is not yet active but that is sufficiently advanced in its planning and design phases can request *pre-operational conditional certification* based on an auditor's review of its site plans and proposed operating procedures. An on-site audit is required within one year of the operation's first receipt of cyanide at the site to confirm that the operation has been constructed and is being operated in compliance with the Code.

A gold mining operation or an individual cyanide facility at an operation is no longer subject to certification after decommissioning of the cyanide facilities. A producer or transporter is no longer subject to certification after it no longer produces or transports cyanide for use in the gold mining industry.

Certification Maintenance

In order to maintain certification, an operation must meet all of the following conditions:

- The auditor has concluded that it is either in full compliance or substantial compliance with the Code.
- An operation in substantial compliance has submitted an Action Plan to correct its deficiencies and has demonstrated that it has fully implemented the Action Plan in the agreed-upon time.
- There is no verified evidence that the operation is not in compliance with the Code.
- An operation has had a verification audit within three years.
- An operation has had a verification audit within two years of a change in ownership, defined as a change of the controlling interest of the operating company.

Auditor Criteria and Review Process

The Institute has developed specific criteria for Code Verification auditors and will implement procedures for review of auditor credentials. Auditor criteria includes requisite levels of experience with cyanidation operations (or chemical production facilities or hazardous materials transport, as appropriate) and in conducting environmental, health or safety audits, membership in a self-regulating professional auditing association and lack of conflicts of interest with operation(s) to be audited.

Dispute Resolution

The Institute has developed and implemented fair and equitable procedures for resolution of disputes regarding auditor credentials and certification and/or de-certification of operations. The procedures provide due process to all parties that may be affected by these decisions.

Information Availability

The Code and related information and code management documentation are available via the Internet at www.cyanidecode.org. The website is intended to promote an understanding of the issues involved in cyanide management and to provide a forum for enhanced communication within and between the various stakeholder groups with interest in these issues. The website is the repository for Code certification and verification information.

ACKNOWLEDGEMENTS

This project was underwritten by a group of gold companies and cyanide producers from around the world. The Gold Institute was instrumental in organizing this financial and technical support and provided the administrative and logistical support necessary to successfully complete the project. This effort represents the first time that an industry has worked with other stakeholders to develop an international voluntary industry Code of Practice.

The individuals listed below participated in the process. Participation by these individuals does not necessarily represent an endorsement of the Code by their respective organizations.

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Harold Barnes (Chairman)[1]	Homestake Mining Company, United States
Stephen Bailey	International Finance Corporation, United States
Julio Bonelli	Government of Peru
Gordon Drake, Ph.D[2]	WMC Resources, Ltd., Australia
John den Dryver[3]	Normandy Mining Limited, Australia
Bill Faust	Eldorado Gold Company, Canada
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[1] Elected Chairman by the Steering Committee
[2] Substituted for Anthony O'Neill at Washington and Vancouver Meetings
[3] Substituted for Anthony O'Neill at Santiago Meeting
[4] Replaced Bill Faust on Committee after Napa Meeting
[5] Added to Steering Committee at Vancouver Meeting
[6] Substituted for Juergen Wettig at Washington, Vancouver and Santiago Meetings

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Australian Gold Reagents, Australia	Mining Project Investors, Australia
Barrick Gold Corp., Canada	Newmont Gold Company, United States
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Gold Fields Limited, South Africa
The Gold Institute, United States
Placer Dome, Inc., Canada
South African Chamber of Mines, South Africa
Rio Tinto, United Kingdom
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APPENDIX C

Cyanide Spills Prevention and Response

CYANIDE SPILLS
PREVENTION AND RESPONSE

by
Dr. T. I. Mudder

INTRODUCTION

This document provides an introductory discussion of a preferred approach for preventing, and if needed, responding to releases into the environment of cyanide containing solutions at gold mining operations. The gold mining industry should demonstrate that it understands the health, safety, and environment risks of using cyanide, and has taken all the necessary precautions to reduce those risks to the extent practicable. It should also demonstrate that it could effectively respond to an accident to mitigate any short and long-term environmental impacts. By definition an accident is neither routine or planned, therefore it is essential to develop and emergency preparedness plans and procedures with the objective of effectively respond to unforeseen accidents. The emergency preparedness plans and procedures must be updated and tested periodically to maintain the level of preparedness at its optimum readiness.

This document deals specifically with cyanide spills that can potentially affect the environment. Issues related to worker health and safety arising out of the use of cyanide in metallurgical processing is covered in other documents. The gold mining industry has had a good record with respect to worker health and safety globally over the last century of cyanide use. Beyond worker health and safety during operations, the major onsite environmental issue relates to controlling the cyanide concentration in uncovered ponds to protect wildlife. The new UNEP International Code for Management of Cyanide at gold mining operations puts forth recommendations as to the appropriate cyanide level that should be maintained in these ponds. A review of cyanide related spills over the last quarter century has shown the causes to include:

- The lack of a dynamic site water balance and comprehensive water management plan
- The lack of or implementation of improper water treatment capabilities
- The lack of integrity and secondary containment within the solution conveyance system

The environmental impacts of these spills have nearly all been related to the toxic effects on aquatic life resulting from cyanide entering surface water, such as a river. In some instances, the impacts were more severe than anticipated due to the type of response taken by the gold mining operation.

More specifically, the severe cyanide spills have resulted overwhelmingly from the breaching or overtopping of tailings dams during high precipitation or runoff events, or the rupture of pipelines without adequate secondary containment and collections systems. In conjunction with the spills, improper emergency treatment exasperated the impacts on aquatic life and the environment due to toxicity of the cyanide destruction chemicals employed, such as chlorine or sodium or calcium hypochlorite. In order to minimize the number and severity of these spills, there is a need for development and implementation of both spill prevention and emergency response plans and procedures.

PREVENTION

Of course preventing a cyanide spill is preferable to responding to one. There are three components to be considered in the development and implementation of a spill prevention plan including:

- Water management
- Water treatment
- Water quality

With respect to water management, a proper water balance must be generated that accurately reflects the annual variations in precipitation patterns with particular emphasis on high intensity events. These variations must be anticipated to the extent possible due to limitations in forecasting and adequate free board made available to accommodate the additional solution volumes. The use of average annual precipitation data is not appropriate for establishment of a site water balance.

In the case of water treatment, a permanent onsite facility is preferred to treat either excess process solutions or tailings slurries on a continuous or an as needed basis. There are several proven technologies available for the recovery, removal, or recycling of cyanide at gold mining operations. These include biological treatment, physical treatment with granular activated carbon, and chemical treatment using alkaline chlorination, copper catalyzed hydrogen peroxide, and the INCO sulfur dioxide/air process.
Although these treatment technologies are suitable when permanent onsite cyanide destruction is required or desired, each of them has distinct disadvantages and advantages. A careful decision must be made when selecting a specific treatment process or combination to ensure it is suitable for the specific application under consideration.

In conjunction with proper storage of cyanide solutions, it is the issue of proper conveyance of these solutions throughout the mine site and secondary containment of these solutions in the event a rupture in a pipeline results due

to either natural and/or human causes.

In considering water quality, there are two important aspects to be considered. The first is the establishment of an appropriate program for the monitoring of water quality both on and off site. The second is the implementation of an appropriate system for minimizing on and off site environmental impacts through lowering of cyanide levels commensurate with the level of protection needed. For example, controlled discharges of excess process solutions into surface waters must be treated to the degree necessary to lower cyanide to levels protective of human health and other wildlife. In the case of direct discharges to surface water, the most vulnerable component of the ecosystem is aquatic life.

On site storage of uncovered solutions like those contained in tailings impoundments must involve lowering of residual cyanide levels that protect wildlife that comes in direct contact with the solution. The lowering of cyanide levels to protect wildlife also provides the additional benefit of reducing the severity of environmental impacts in the event there is an inadvertent release or spill of solution into the environment.

Adherence to the water management, treatment, and quality principles associated with a sound spill prevention program and the newly created UNEP International Code for Management of Cyanide will dramatically improve the status of environmental protection in the gold mining industry. To aid in the implementation of these principles, there is a need for ongoing training of the workforce to foster a sense of pride and purpose with respect to protecting the environment.

EMERGENCY RESPONSE

Regardless of the level of preparation and training, accidents do occur due to human error, mechanical failure, and nature. The goal of emergency response is to protect human health and the environment to the extent possible through minimization of impacts. It is critically important that emergency response be carried immediately in accordance with a well thought out and administered plan.
There are five basic elements to consider in developing and implementing an emergency response plan or procedure:

- Notification
- Containment
- Treatment
- Monitoring
- Training

Notification of the appropriate site personnel, as well as local, state, and federal agencies must be an immediate priority in the event a cyanide spill occurs at a mining operation, regardless of the time of day. Of critical importance in the event of a cyanide spill reaching surface water, is the notification of all down stream individuals, municipalities, or other industrial users that rely upon it as a primary source of potable water. Other notifications include those required under law or those noted in the operating permit for the mine. The notification process should involve a single call from a worker to an individual of authority, who is on call and on behalf of the company makes the appropriate notifications. A designated chain of command must be established to ensure the notification process proceeds without interruption.

Containment of the cyanide spill on site should be the first physical priority in conjunction with proper notification. If there is any indication that the pH of the solution has been lowered and hydrogen cyanide gas has been released, all personnel accessing the spill area should be equipped with a self-contained breathing apparatus. A decision must be made immediately regarding the evacuation of the other on site and off site personnel to some predetermined distance. Containment could involve diverting the spill to a holding pond, building a temporary dam or collection system, and/or pumping of solution. If the spill is from a tailings impoundment in which the cyanide levels have been lowered for protection of wildlife, then further treatment may not be necessary. However, if the cyanide levels are at full strength and/or the spill could enter surface water, then further treatment could be mandatory.

Treatment of the spill to lower the cyanide concentration may become necessary if it is or could eventually enter surface water and effect the environment or human health down stream of the mine site. Treatment is only effective if it can be accomplished in conjunction with the occurrence of the spill. If the spill has already occurred, then addition of treatment chemicals to surface water, like a stream, is not advised, since the addition of these chemicals could result in additional environmental impacts and are generally not effective in downstream cyanide levels.
Specifically, chlorine or hypochlorite reagents are not recommended for direct treatment of cyanide spills in flowing surface water, since these compounds are quite toxic and form additional toxic intermediates that can cause further undesirable environmental impacts. Furthermore, ferrous iron reagents should not be added directly to surface water to precipitate cyanide as this too will result in secondary adverse environmental impacts if done improperly.

If treatment is deemed necessary and appropriate and a permanent treatment facility is not already available, then selection of either hydrogen peroxide for treatment of solution spills or the INCO sulfur dioxide/air process for treatment of slurry spills is preferred. These chemicals should only be used as a last resort if containment is not achievable and the spill can be treated directly at the point of release.

Although additional chemicals are being added in conjunction with these treatment processes, their impacts are limited in comparison to those arising from the use of chlorine or hypochlorite. Removal of cyanide with ferrous sulfate is not recommended either as this process involves merely precipitation of the cyanide as an insoluble iron salt, which can again dissolve under elevated pH conditions releasing free cyanide. A permanent treatment facility of some type should be mandatory at a mining operation that utilizes cyanide in elevated concentrations.

Monitoring of on site and off site downstream water quality must be incorporated into an emergency response plan. If the cyanide spill reaches an off site surface water source, then extensive monitoring of water quality downstream must be initiated to determine the extent of the spill and potential environmental impacts. As soon as possible, additional monitoring of sensitive ecosystems, such as aquatic life, should be implemented. The more intensive water quality monitoring program should continue until there is no further threat to human health or the environment.

Training of on site personnel and members of the public should be associated with the entire spill prevention and emergency response program. Training should include the various aspects of cyanide chemistry, toxicity, analysis, and treatment. The training should be ongoing with periodic updates and simulated spill events to maintain optimal response performance. With respect to the public there should be ongoing awareness training of the community as a whole but also specific hazardous materials and emergency response training of specific individuals such as firemen, policemen, and other government personnel depending upon local conditions.

APPENDIX D

Spill Procedures for Products on Site

AMMONIUM NITRATE
FUEL MIXTURE (ANFO)

CONSIDER ACTION ONLY IF SAFETY PERMITS!
ELIMINATE IGNITION SOURCES
If safe stop the source of spill

On land	• Block entry into waterways • Do not flush into sewer/drainage system • Contained fuel will float to surface, use absorbent • Contain spill by dyking with earth or other barrier • If liquid, remove minor spills with sorbents, large spills with pumps or vacuum equipment • Prills /granules can be shovelled or removed mechanically
On snow and ice	• Block entry into waterways and contain with snow or other barrier • Remove ammonium nitrate and contaminated snow with shovels or other mechanical means
On tundra	• Do not deploy personnel and equipment on marsh or vegetation • Remove ammonium nitrate and contaminated snow with shovels or other mechanical means if feasible • Burning is not feasible • Flushing with low pressure water can be tried if feasible • Minor spill amounts can be left in place to serve as fertilizer • Minimize damage caused by equipment and excavation
On water	• Ammonium nitrate sinks and mixes with water; contain spill by isolating contaminated water through damming or diversion • Flushing with water can be tried, if spill area cannot be isolated
Streams	Ammonium nitrate is completely soluble in water and is difficult to recover. Water flushing can be tried do disperse spill
Storage and transfer	Store closed, labelled containers in cool, ventilated areas away from incompatible materials
Disposal	• Segregate waste types • Place contaminated materials into marked containers • Consult with environmental authorities during final disposal

DIESEL / P40 / P50, HYDRAULIC, LUBE AND WASTE OIL

CONSIDER ACTION ONLY IF SAFETY PERMITS!
ELIMINATE IGNITION SOURCES
If safe stop the source of spill

On land	• Block entry into waterways • Do not flush into sewer/drainage system • Contain spill by dyking with earth or other barrier • If liquid, remove minor spills with sorbents, large spills with pumps or vacuum equipment • Prills /granules can be shovelled or removed mechanically
On snow and ice	• Block entry into waterways and contain with snow or other barrier • Remove minor spills with sorbent pads and/or snow • Use ice augers and pump to recover diesel under ice • Slots in ice can be cut over slow moving water to contain oil • Burn accumulated diesel from the surface using Tiger Torches if feasible and safe to do so
On tundra	• Do not flush into ditches or drainage systems • Block entry into waterways and contain with earth, snow or other barrier • Remove small spills with sorbent pads • On tundra use peat moss and leave in place to degrade, if practical • Do not deploy personnel and equipment on marsh or vegetation • Remove pooled diesel with pumps and skimmers • Flush with low pressure water to herd diesel 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 spill containment boom to concentrate slicks for recovery • On small spills, use sorbent pads to pick up contained oil • On larger spills, use skimmer on contained slicks • Do not deploy personnel and equipment onto mudflats or into wetlands
Streams	• Prevent entry into water, if possible, by building berm or trench • Intercept moving slicks in quiet areas using (sorbent) booms • Do not use sorbent booms/pads in fast currents and turbulent water
Storage and transfer	• Store closed labelled containers outside away from flammable sources • Electrically ground containers and vehicles during transfer
Disposal	• Segregate waste types • Place contaminated materials into marked containers • Consult Site Services Manager on disposal procedures

JET A, GASOLINE

CONSIDER ACTION ONLY IF SAFETY PERMITS!
ELIMINATE IGNITION SOURCES
If safe stop the source of spill

On land	• Block entry into waterways • Do not flush into ditches sewer/drainage system • Contain spill by dyking with earth or other barrier • If liquid, remove minor spills with sorbent, large spills with pumps or vacuum equipment • Prills /granules can be shovelled or removed mechanically
On snow and ice	• Block entry into waterways by dyking with snow or other barrier • Do not contain spill if there is any chance of igniting vapours • In work/depot yards, apply particulate sorbents
On tundra	• Block entry into waterways by dyking with earth, snow or other barrier(s) • Do not contain spill if there is any chance of igniting vapours • On shop floors and in work/depot yards, apply particulate sorbents • On tundra use peat moss and leave to degrade if feasible to do so • Remove pooled liquid with pumps, if safe to do so • Do not deploy personnel and equipment on marsh or vegetation • Low pressure flushing can be tried to disperse small spills • Burn CAREFULLY 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 digging
On water	• Contain or remove spills ONLY AFTER VAPOURS DISSIPATE • Use booms to protect water intakes • Skimming can be tried once light ends evaporate
On streams	• Prevent entry into water, if possible, by building berm or trench • Intercept moving slicks in quiet areas using (sorbent) booms • Do not use sorbent booms/pads in fast currents and turbulent water
Storage and transfer	• Store closed, labelled containers in cool, ventilated areas away from incompatible materials • Electrically ground containers and vehicles during transfer
Disposal	• Segregate waste types • Place contaminated materials into marked containers • Consult Site Services Manager on disposal procedures

ANTIFREEZE (ETHYLENE GLYCOL)

CONSIDER ACTION ONLY IF SAFETY PERMITS!
If safe stop the source of spill

On land	• Block entry into waterways • Do not flush into ditch/drainage system • Contain spill by dyking with earth, snow or other barrier • Remove minor spills with peat moss and/or sorbent pads • Remove large spills with pumps or vacuum equipment
On snow and ice	• Block entry into waterways by dyking with snow or other barrier • Do not contain spill if there is any chance of igniting vapours • In work/depot yards, apply particulate sorbents • Remove contaminated snow with shovels or mechanical equipment
On tundra	• Do not deploy personnel and equipment on marsh or vegetation • Block entry into waterways by dyking with earth, snow or other barrier(s) • On shop floors and in work/depot yards, apply particulate sorbents • Low pressure flushing can be tried to disperse small spills • Burning is not feasible • Minimize damage caused by equipment and digging
On water	• Ethylene glycol sinks and mixes with water • Contain spill by isolating contaminated water through damming or diversion • Use spill containment boom to protect water intakes and sensitive areas
On streams	• Prevent entry into water, if possible, by building berm or trench • Intercept moving slicks in quiet areas using (sorbent) booms • Do not use sorbent booms/pads in fast currents and turbulent water
Storage and transfer	• Store closed labelled containers in cool, ventilated areas away from incompatible materials, e.g., oxidizable materials, finely divided metals and organics
Disposal	• Segregate waste types • Place contaminated materials into marked containers • Consult with environmental authorities during final disposal

SULPHURIC AND HYDROCHLORIC ACID

CONSIDER ACTION ONLY IF SAFETY PERMITS!
If safe stop the source of spill

On land	• Block entry into waterways • Do not flush into ditch/drainage system • Contain spill by dyking with earth, snow or other barrier • Remove minor spills with dry earth, sand or other barrier • Neutralization with lime, sodium bicarbonate or crushed limestone • Remove large spills with pumps or vacuum equipment after neutralization
On snow and ice	• Block entry into waterways by dyking with snow or other barrier • Do flush into ditches or drainage system • Remove minor spills with dry snow or other barrier • Neutralization with lime, sodium bicarbonate or crushed limestone • Remove large spills with pumps or vacuum equipment after neutralization • Remove contaminated snow with shovels or mechanical equipment
On tundra	• Do not deploy personnel and equipment on marsh or vegetation • Block entry into waterways by dyking with earth, snow or other barrier(s) • Neutralization with lime, sodium bicarbonate or crushed limestone • Removed polled nitric acid with pump or vacuum equipment after neutralization • Burning is not recommended • Minimize damage caused by equipment and digging
On water	• Sulphuric and Hydrochloric acid will dissolve in water • Contain spill by isolating contaminated water through damming or diversion • Flushing with water can be tried, if spill area cannot be isolated • Neutralization with lime or sodium bicarbonate can be tried
On streams	
Storage and transfer	• Corrodes metal such as Aluminum, copper, zinc and their alloys • Use plastic containers • Store closed labelled containers in cool, ventilated areas away from incompatible materials, e.g., oxidizable materials, oil and wood
Disposal	• Segregate waste types • Place contaminated materials into marked containers • Consult with environmental authorities during final disposal

ACTIVATED CARBON

CONSIDER ACTION ONLY IF SAFETY PERMITS!
If safe stop the source of spill

On land	• Block entry into waterways • Do not flush into ditch/drainage system • Vacuuming is the best clean up procedure • Remove contaminated snow with shovels or mechanical equipment
On snow and ice	• Block entry into waterways by dyking with snow or other barrier • Do flush into ditches or drainage system • Vacuuming is the best clean up procedure • Remove contaminated snow with shovels or mechanical equipment
On tundra	• Do not deploy personnel and equipment on marsh or vegetation • Block entry into waterways by dyking with earth, snow or other barrier(s) • Vacuuming is the best clean up procedure • Remove contaminated snow with shovels or mechanical equipment Burning is not recommended
On water	• Contain the spill area • Vacuuming is the best clean up procedure • Remove contaminated snow with skimmers or mechanical equipment
On streams	
Storage and transfer	• Check oxygen content of atmosphere of any vessel containing activated carbon before allowing entry of personnel • Packaged activated carbon is not resistant to weather or outside storage and requires indoor Type I and Type II storage facilities
Disposal	• Segregate waste types • Place contaminated materials into marked containers • Wet or dry activated carbon is best disposed by landfill • Consult with environmental authorities during final disposal

HYDROGEN PEROXIDE

CONSIDER ACTION ONLY IF SAFETY PERMITS!
ELIMINATE IGNITION SOURCES
If safe stop the source of spill

On land	• Avoid runoff into waterways • Clean up spills immediately • Use protective equipment • Use water spray to disperse the gas/vapour • Absorb spill using an absorbent, non-combustible material • Flush spill are with water • Provide ventilation • Do not get water inside containers • Keep combustibles away from spill
On snow and ice	• Block entry into waterways by dyking with snow or other barrier • Do flush into ditches or drainage system • Use protective equipment • Use water spray to disperse the gas/vapour • Absorb spill using an absorbent, non-combustible material • Keep combustibles away from spill • Remove contaminated snow with shovels or mechanical equipment
On tundra	• Do not deploy personnel and equipment on marsh or vegetation • Block entry into waterways by dyking with earth or other barrier • Do flush into ditches or drainage system • Use protective equipment • Use water spray to disperse the gas/vapour • Absorb spill using an absorbent, non-combustible material • Keep combustibles away from spill • Remove contaminated snow with shovels or mechanical equipment
On water	
Storage and transfer	• Segregate waste types • Place contaminated materials into marked containers • Contents may develop pressure upon storage • Keep container tightly closed • Store protected from light, below 35 ºC • Avoid contact with combustible materials and keep away from heat, sparks and flame • Store in a cool, dry, well-ventilated area away from incompatible substances (alkalis, oxidizable materials, finely divided metals, alcohols and permanganate)
Disposal	• Rinse empty containers and drums thoroughly with water before discarding • Consult with environmental authorities during final disposal

POTASSIUM AMYL XANTHATE

CONSIDER ACTION ONLY IF SAFETY PERMITS!
ELIMINATE IGNITION SOURCES
If safe stop the source of spill

General	• Evacuate area of all unnecessary personnel • Wear protective equipment and/or garments described in personal protection, if exposure conditions warrant • When entry into or exit from concentrations of unknown exposure, use NIOSN/MSHA approved self-contained breathing apparatus (SCBA). Contain spill. Protect from ignition
On land	• Block entry into waterways by dyking with soil, sand or other barrier • Do flush into ditches or drainage system • Use protective equipment • Sweep or vacuum up spill
On snow and ice	• Block entry into waterways by dyking with snow or other barrier • Do flush into ditches or drainage system • Use protective equipment • Sweep or vacuum up spill • Remove contaminated snow with shovels or mechanical equipment
On tundra	• Do not deploy personnel and equipment on marsh or vegetation • Block entry into waterways by dyking with earth or other barrier • Do flush into ditches or drainage system • Use protective equipment • Sweep or vacuum up spill
On water	Do not release water collect and dispose properly
Storage and transfer	• Transfer to disposal drums using non-sparking equipment • Segregate waste types • Place contaminated materials into marked containers
Disposal	• Waste disposal (insure conformity with all applicable disposal regulations • Incinerate or place in permitted waste management facility • Consult with environmental authorities during final disposal

AEROPHINE 3418A PROMOTER

CONSIDER ACTION ONLY IF SAFETY PERMITS!
If safe stop the source of spill

On land	• Block entry into waterways by dyking with soil, sand or other barrier • Do flush into ditches or drainage system • Use protective equipment • Sweep or vacuum up spill
On snow and ice	• Block entry into waterways by dyking with snow or other barrier • Do flush into ditches or drainage system • Use protective equipment • Sweep or vacuum up spill • Remove contaminated snow with shovels or mechanical equipment
On tundra	• Do not deploy personnel and equipment on marsh or vegetation • Block entry into waterways by dyking with earth or other barrier • Do flush into ditches or drainage system • Use protective equipment • Sweep or vacuum up spill
On water	• Dissolves in water • Hold water until neutralized • Dilution could be considered
Storage and transfer	• Store as per manufactures directions in a dry facility • Segregate waste types • Place contaminated materials into marked containers
Disposal	• Cytec recommends that organic materials classified as hazardous waste according to the relevant local or national regulations be disposed of by thermal treatment or incineration at approved facilities • Consult with environmental authorities during final disposal

CAUSTIC SODA (SODIUM HYDROXIDE)

CONSIDER ACTION ONLY IF SAFETY PERMITS!
If safe stop the source of spill

On land	• Block entry into waterways; • Do not flush into ditch/drain systems • Contain spill by dyking with earth, sand or other barrier • Remove minor spills with earth, sand or vermiculite sorbent • Large spills in solution with pumps or vacuum equipment • Neutralization with dilute hydrochloric acid can be tried
On snow and ice	• Block entry into waterways; • Contain spill by dyking with snow or other barrier • Do not flush into ditch/drain systems • Remove minor spills with dry earth, sand or vermiculite sorbent • Remove contaminated snow with shovels or other mechanical equipment
On tundra	• Do not deploy personnel and equipment on marsh or vegetation • Block entry into waterways • Remove minor spills with sand or vermiculite sorbent • Low pressure water flushing can be tried if feasible
On water	• Caustic soda sinks and mixes with water generating heat • Isolate/confine spill by damming or diversion if feasible • Remove pooled caustic soda after neutralization with pumps • Water flushing can be tried to disperse the caustic sodas • Neutralization with dilute hydrochloric acid can also be tried
On streams	• Caustic soda sinks and mixes with water generating heat • Water flushing can be tried to disperse the caustic sodas • Neutralization with dilute hydrochloric acid can also be tried
Storage and transfer	• Store closed, labelled containers in cool, ventilated areas away from incompatible materials • Protect from contact with water • May react with aluminium, zinc and tin metals to generate flammable and potentially explosive hydrogen gas • Avoid contact with strong oxidizers, such as nitric acid, sulphuric acid, chlorine, ozone, peroxides
Disposal	• Place contaminated materials in segregated, marked containers • Consult with environmental authorities during final disposal

SODIUM NITRATE

CONSIDER ACTION ONLY IF SAFETY PERMITS!
If safe stop the source of spill

On land	• Block entry into waterways; do not flush into ditch/drain systems • Contain spill by dyking with earth, sand or other barrier
On snow and ice	• Block entry into waterways; do not flush into ditch/drain systems • Contain spill by dyking with snow or other barrier • Remove spills by sweeping up material for disposal
On tundra	• Do not deploy personnel and equipment on marsh or vegetation • Block entry into waterways; do not flush into ditch/drain systems • Contain spill by dyking with earth, snow or other barrier • Remove spills by sweeping up material for disposal
On water	• Dissolves in water • Isolate/confine spill by damming or diversion if feasible • Water flushing can be tried to disperse the sodium nitrate
On streams	• Dissolves in water • Water flushing can be tried to disperse the sodium nitrate
Storage and transfer	• Store closed, labelled containers in cool, ventilated areas away from incompatible materials • Keep away from reducing agents and liquids of low flash point
Disposal	• Dispose of in accordance with local, provincial and federal environmental regulations • Wood and empty paper bags should be removed • Consult with environmental authorities during final disposal

SODIUM CYANIDE

CONSIDER ACTION ONLY IF SAFETY PERMITS!
If safe stop the source of spill

On land	• Block entry into waterways; do not flush into ditch/drain systems • DO NOT allow entrance in soil stretches of water drainage systems • Avoid formation of dust • Ensure sufficient ventilation • Use protective equipment • Avoid skin contact because of the danger of skin absorption • Cyanide-containing sewage water and solutions must be decontaminated before entering public canal network or stretch of water • Remove spills by sweeping up material for disposal
On snow and ice	• Block entry into waterways; do not flush into ditch/drain systems • Contain spill by dyking with snow or other barrier • Remove spills by sweeping up material for disposal
On tundra	• Do not deploy personnel and equipment on marsh or vegetation • Block entry into waterways; do not flush into ditch/drain systems • Remove spills by sweeping up material for disposal
On water	• Dissolves in water • Isolate/confine spill by damming or diversion if feasible • Neutralisation/decontamination must be provided
On streams	• Dissolves in water • Neutralisation/decontamination must be provided, if feasible
Storage and transfer	• Store hermetically closed, labelled containers in cool, ventilated areas • DO NOT store together with acids
Disposal	• Dispose of in accordance with local, provincial and federal environmental regulations • Consult with environmental authorities during final disposal

RAW SEWAGE

CONSIDER ACTION ONLY IF SAFETY PERMITS!
Avoid direct contact with raw sewage
If safe stop the source of spill

On land	• Block entry into waterways • Do not flush into ditch/drain systems • Contain spill by dyking with earth or other barrier • Remove spill with pumps or vacuum equipment • On tundra use peat moss and leave in place to degrade, if feasible
On snow and ice	• Block entry into waterways; • Contain spill by dyking with snow or other barrier • Do not flush into ditch/drain systems • Remove contaminated snow with shovels or other mechanical means
On tundra	• Do not deploy personnel and equipment on marsh or vegetation • Remove pooled sewage with pump or vacuum equipment • Minimize damage caused by equipment and excavation
On water	• Isolate/confine spill by damming or diversion if feasible • If not possible to confine and pump, disperse using water flushing
Storage and transfer	• Store closed, labelled containers in cool, ventilated areas • Avoid contact with collected material
Disposal	• Place contaminated materials into marked containers • Transport to sewage treatment plant • Dispose of in accordance with local, provincial and federal environmental regulations • Consult with environmental authorities during final disposal

ACETYLENE AND PROPANE

CONSIDER ACTION ONLY IF SAFETY PERMITS!
ELIMINATE IGNITION SOURCES, Keep vehicles away from accident area
If safe stop the source of spill

- Vaporous cannot be contained when released
- Water spray can be used to knock down vaporous if there is NO chance of ignition
- Personnel should withdraw immediately from area unless it is a small leak that has been stopped immediately after detection
- If tanks are damaged, gas should be allowed top disperse and no attempted recovery made
- Personnel should avoid touching release point on container since frost quickly forms
- Keep away from tank ends

APPENDIX E

Chemical Handling Procedures

PROCEDURE FOR TRACKING OF CHEMICALS

Tracking of chemicals is an essential component of a comprehensive environmental management system. Being aware of chemicals that are planned, purchased, stored, and used, and that become hazardous wastes is the essence of the system. Key components of the tracking system include an inventory, important information about the chemical, and a mass balance.

1. Purpose

1.1. To make sure all chemicals are identified and accounted for in all phases of the operation.

1.2. To reduce the volume and/or toxicity of chemicals on-site.

1.3. To detect early any significant leak or spill of chemicals.

2. Scope

2.1. This procedure covers chemicals used in mining, processing, catering/janitorial, and all other aspects of the operation.

3. Responsibilities

3.1. The purchaser of the chemical is responsible for notifying the environmental department when a new chemical is introduced into the operation. The purchaser is also responsible for tracking of chemical quantities and reporting this to the environmental department.

3.2. The environmental department is responsible for keeping facility-wide inventories of chemicals by type and quantity. The environmental department must also compare this data to emissions and discharges to determine if leaks have occurred.

4. Procedure

4.1. Identify Responsible Individual

A person who is responsible for all chemical tracking at the site will be identified. Many people may be involved; however, one individual should coordinate the overall effort for the entire organization.

4.2. Inventory

Inventory the chemicals planned and on-site and enter this information into a software system. For example, it should be indicated whether the chemical is planned or on-site. The quantity of the chemical in use, in storage, and being discharged needs to be recorded on an ongoing basis. The discharged amount would be in accordance with permits and regulations and include that to sewers, water bodies, air, and landfill. The amounts presently being recycled, reused, or sold should also be added into the inventory and so designated.

4.3. Other Information

Additional information should be entered into the software system, however, this may require some research into material safety data sheets or calls to the manufacturer. For example, the composition of the chemical along with Chemical Abstract System (CAS) numbers should be added. Hazard rating information should also be added.

4.4. Ongoing Review and Entry of Information

There will be on-going review of invoices, shipping documents, manifests, plans, and other information, which is added to the software system. The system should track, balance and account for, all chemicals. This helps to ensure that some have not leaked or been spilled from their containers.

4.5. Enforcement of Chemical Purchase Procedures

As all the numbers are obtained, there may be cases where it is found some individuals are not following the chemical purchase procedures. When this happens they will be reminded of the procedure.

4.6. When the Numbers Don’t Add Up

If the mass balance shows that there are significant volumes of chemicals unaccounted for some additional research will be needed. If it is not just an error in calculation, it might be a leaking storage tank or a spill.

APPENDIX F

Hydrocarbon Fuel & Gas Dispensing Procedure

Standard Operating Procedure

Hydrocarbon Fuel & Gas Dispensing Procedure

MHBLMAIN-FGDP-SOP-2004

MIRAMAR
HOPE BAY LTD.

Document # MHBLMAIN-FGDP-SMOP-2004
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Approved By:

Position	Name	Signature	Date
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Document Control Record

The re-issues of this document, listed below, have been reviewed and approved by Quality Assurance and Management and are authorised for use within the Miramar Hope Bay Ltd organisation. The footer "Control Document" is in red.

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		Site Supervisor	Patch Lake (Major)	
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1 INTRODUCTION

1.1 General

This document describes the petroleum products handling procedures to be used by Miramar Hope Bay Limited personnel. These procedures have been developed from legislative requirements, guidelines and updated work procedures intended to promote good practices and continual improvement in fuel handling at all our properties along the Hope Bay belt. This document will be review regularly with the intent to continually improve safety and environmental performances.

1.2 The dangers

Petroleum products are flammable and combustible liquids which can give off flammable vapour, even at very low temperatures. This means there is always a risk of fire or explosion if a source of ignition is present. It floats on the surface of water and may travel long distances, eventually causing danger away from the place where it escaped. Vapour does not disperse easily and may also travel long distances. It tends to sink to the lowest possible level and may collect in tanks, cavities, drains, pits, or other enclosed areas, where there is little air movement. Flammable atmospheres may be present in empty storage tanks and containers. There is also a danger if products are spilled on clothing, rags and receiving environment.

1.3 Glossary

AST- means above ground storage tank (capacity greater than 230 litres (L)) which at least 90% above surface grade.

Berm - means an impermeable system for containing links and spills. In tank farms containing a single tank, it must be of sufficient size to contain the volume of the tank plus 10%. For a multi-tank farm facility the berm must contain 110% of the largest tank or 100% of the largest tank plus 10% of the aggregate volume of all the tanks within the berm, which is greater. The berm can be constructed of steel, concrete, or soil in combination with a geotextile liner that is compatible with and impermeable to the stored liquid.

Drum - means a barrel having capacity of less than 230 L (50 imperial gallons) but greater than 23 litres (5 imperial gallons).

Flammable liquids, combustible liquids - means liquids with a flash point below 37.8 ºC are referred to as flammable liquids, whereas liquids with a flash point at or above 37.8 ºC are referred to as combustible liquids.

Flash point - means the lowest temperature at which a liquid or solid (e.g. petroleum product) gives off vapour of sufficient concentration to form an ignitable mixture in air.

Fix location - means any location that is used to store a fuel tank (or container), regardless of the length of time it is being stored.

Fuel cache - means a temporary storage (e.g. seasonal) of drums at a remote location.

Fuel facility - means any location (may include a remote fuel cache) at which flammable liquids or combustible liquids are dispensed from a tank vehicle or fixed storage tank into a fuel tank of a motor vehicle, equipment or watercraft.

Overfill protection - Includes: prevention of tanks from being overfilled by providing continuous supervision of the filing operation by personnel qualified to supervise such an operation; or an overfill protection devise conforming to ULC/ORD-C58.15, "Overfill protection Devices for Flammable Liquid Storage Tanks."

Examples include float valve shut off devices, audible or visible overfill alarm systems, automatic sensing and shut-off devices and vent restriction devices.

Risk assessment **–** means the rating of relative risks which includes: environmental, operational and prevention/preparedness factors that is expected to be made and documented whenever fuel is stored at a new location.

Secondary containment - means structures used for spill control such as:

- A double walled container (or tank within a tank design);
- A steel or concrete container (tank within a box design) capable of containing 110% of the volume being stored (should be manufactured to a ULC specification);
- An earth or clay dyke which is lined with an impermeable geomembrane material and is capable of containing 110% of the volume stored; or
- A site which is graded or sloped to divert a spill into a collection system where it will not impact public health, safety or the environment. The containment should be lined with a geomembrane to prevent contaminating the subsurface soil layer.

Spill control - means site selection and storm water management practices and techniques to prevent spills from entering natural waterways. It may include techniques and structures for diverting or containing spills and preventing them from entering storm water drains and sanitation sewers, and may include grading the site, and using double walled tanks and tank-in-box systems.

Storage tanks - means a vessel for flammable or combustible liquids having a capacity greater than 230 L designed to be installed in a fixed location.

Tank farm - means any facility where bulk petroleum products/hydrocarbons fuels are stored in storage tank (s).

Tank vehicle - means any vehicle, other than railroad tank cars and boats, with a cargo tank having a capacity greater than 454 L, mounted or built as an integral part of the vehicle and used for the transportation of flammable liquids or combustible liquids and including tank trucks, trailers and semi trailers.

Truck-box fuel tank (includes slip tank or Tidy tank) - means a portable container used for transportation of fuels on a truck. The capacity may vary depending on the type of tank.

2 RESPONSIBILITY

2.1 Site Supervisor

The Site Supervisor is accountable to the General Manager - Northern Operations, responsible for the Miramar Hope Bay Limited project. In his/her responsibility relating to fuel management, the site supervisor shall ensure that:-

a. As per the legislative requirement, the Site Supervisor has a responsibility towards the operator and the second attendant, both to take all reasonable steps to ensure their safety and to equip them to do their jobs without danger to themselves, others or the receiving environment.

b. An assessment of the risks arising from the petroleum products transportation, storage, and dispensing operation at site in areas of responsibility shall be done and to take steps to eliminate or control those risks.

c. All maintenance employees responsible for fuel handing are trained and signed off by the Site supervisor. This training shall be done according to the Miramar Hope Bay Limited Fuel Handling Training protocol.

d. All training records shall be filed and readily available.

e. Dispensing of any petroleum products from the fuel farm shall not take place until: -

- Site Supervisor unlocks the valve;
- Supervise dispensing and refuelling; and
- Site Supervisor locks the valve after dispensing and refuelling.

f. Good housekeeping practices are maintained at all times;

g. Keep a record of fuel dips for all storage tanks in his/her area of responsibility. The following conditions apply depending on the frequency of usage.

- If used monthly – Dips taken weekly;
- If used weekly – Dips taken daily; and
- If used daily – Dips taken immediately after each dispensing trip.

h. Fuel storage tanks not actively being drawn from must be inspected and dipped weekly. Findings must be recorded on the Fuel Storage Facility Checklist form.

i. Monthly inspections of all fuel storage facilities must be conducted and recorded on the Fuel Storage Facility Checklist form.

j. Daily inspections of fuel storage facilities must be recorded in the Site Supervisors Daily Fuel Storage Facility Inspection Logbook.

2.2 Patch Lake Fuel Farm - Special Amendment

a. Weekly fuel storage inspections shall be carried out of all fuel storage tanks at Patch Lake Fuel Farm. This is **CRITICAL** for the tanks located outside of the containment area. A visual inspection must be conducted to determine the integrity of the internal secondary containment of each tank.

b. All hazards, damage and potential conditions to a tank, transfer fuel line or pumps that would undermine the integrity of that structure which would cause a concern for a spill or gradual leak shall be identified and corrected and/or reported immediately for further follow up action.

c. The use of the Fuel Storage Facility Checklist form will be used for the weekly inspections and submitted as part of the month end reports. All reports shall be documented, electronically filed and readily made available for auditing.

d. Weekly **VISUAL** inspection for signs of leakage will be conducted by the Site Supervisor of the area inside of the large Enviro-tanks. This inspection **MUST** be completed from the inspection hatch **OUTSIDE** of the tank. **DO NOT ENTER THE TANK!** Special consideration must be given to Confined Space Entry Procedures and specialized equipment to enter the tank for further inspection. This **MUST** be approved by the Manager, Northern Operations.

e. If required a dip shall be completed from outside of the inspection hatch to identify source of water/fuel and any changes in level, which might be an indicator of a breach inside the tank.

f. For all MHBL sites, preventive maintenance (PM) on all storage tanks and dispensing systems are done monthly. Any form of maintenance or changes to the dispensing system

shall be documented and reported in the monthly report. All WHIMS signs are clearly displayed on each storage facility.

g. All Spill kits are stocked with appropriate materials and available at each fuel storage area. The following should be taken into consideration.
   - A sufficient backup supply should be available on site if or when required at short notice.
   - Monthly stock take of the spill kits - location of kits and quantity of materials in each kit.

h. All empty fuel storage containers should be collected, counted and sent off site for recycling.

i. Provide monthly fuel status report to Human Resource Superintendent.

2.3 Petroleum Product Dispenser/Operator

The dispenser/operator is accountable to the Site Supervisor. In his/her responsibility relating to fuel management, the dispenser/operator (you) shall ensure that:-

- You have a duty to look after your own safety and that of others.
- It is your legal responsibility to inform your employer if you identify any potentially dangerous situations which are not being controlled at the work area. The essential steps to the inspection are:
  - STEP 1 - Look for the hazards;
  - STEP 2 - Decide who or what might be harmed and how;
  - STEP 3 - Evaluate the risks arising from the hazards and decide whether existing controls are adequate or more should be done;
  - STEP 4 - Record the significant findings of the assessment on your 5-point safety card;
  - STEP 5 - If the existing controls are inadequate, inform site supervisor immediately on Radio Channel # 2 (Windy Camp), Channel # 4 (Boston Camp) and Channel #1 (Patch Lake and other areas along the Belt).
- Trained in Fuel handling and dispensing procedures.
- A fire extinguisher and a spill kit are available.
- Be seen by the second attendant at all times and that your view is not obstructed.
- Proper procedures are followed throughout the dispensing/filling operation, e.g. dispenser nozzles are correctly inserted, delivery hoses are not stretched or kinked and tripper latches are not wedged open with any other objects.
- Vehicle engines are switched off when at the dispensers.
- No smoking in the vicinity of the dispenser nozzle.
- To fill containers with petroleum products, use only those which are approved.
- Earth wire is grounded.

- ALWAYS check carefully that there is no danger before you start dispenser nozzle and during its operation.
- Use your fingers to squeeze the trigger and stay with the dispenser nozzle until the task is completed.

2.4 Second Petroleum Product Dispenser/Attendant

The second attendant is accountable to the Site Supervisor. In his/her responsibility relating to fuel management, the dispenser/operator (you) shall ensure that:-

- You have a duty to look after your own safety and that of others.
- It is your legal responsibility to inform your employer if you identify any potentially dangerous situations which are not being controlled at the work area. The essential steps to the inspection are:
    - STEP 1 - Look for the hazards;
    - STEP 2 - Decide who or what might be harmed and how;
    - STEP 3 - Evaluate the risks arising from the hazards and decide whether existing controls are adequate or more should be done;
    - STEP 4 - Record the significant findings of the assessment on your 5-point safety card;
    - STEP 5 - If the existing controls are inadequate, inform site supervisor immediately on Radio Channel # 2 (Windy Camp), Channel # 4 (Boston Camp) and Channel #1 (Patch Lake and other areas along the Belt).
- Trained in Fuel handling and dispensing procedures.
- A fire extinguisher and a spill kit are available.
- Be seen by the dispenser/operator at all times and that your view is not obstructed.
- No smoking when carrying out this task.
- Earth wire is grounded.
- Stay with the open valve until instructed to shut the valve off to closed position.

3 DISPENSING PROCEDURE

Every trained and competent personnel dispensing flammable liquids and combustible liquids shall:

a. Take precautions to prevent overflow or spillage of the liquid being dispensed;

b. Not knowingly overfill the fuel system;

c. In the event of spillage, immediately apply a non-combustible absorbent material to soak up the spillage;

d. Not dispense gasoline or diesel within 7.5 meters of any ignition source;

e. Not use any OBJECT or DEVICE that is not an integral part of the hose nozzle valve assembly to maintain flow of fuel; and

f. Report any spillage or near miss immediately to your supervisor.

3.1 Dispensing of fuel from the fuel farm

Dispensing of any petroleum products from any Fuel Farm along the Belt ***shall not*** be carried out without the ***supervision*** of the ***Site Supervisor*** and a ***second attendant.***

a. The second attendant dips and records the volume of the storage tank before dispensing takes place.

b. The dispenser/operator uncoils the hose and stretches the hose towards the refilling tanks.

c. Dispenser/operator secures the dispenser nozzle into an empty 205 drum and opens the lid of the tidy tank or an approved container used for transporting fuel. ***(Note: if container is attached to a vehicle, ensure that the engine is switched off and the container is securely fastened before any dispensing taking place).***

d. The dispenser/operator inserts the dispensing nozzle into opening and asked the Site Supervisor to unlock the dispensing valve.

e. The second attendant then push the lever to open position and keeps it open until asked to turn it to off position.

f. The dispenser/operator squeezes the trigger with his/her fingers and allows the fuel to drain in to the tank. Checks the tank level regularly.

g. When fuel approaches the 85% level, he/she informs the second attendant to push the lever to close position. This will allow for all the fuel still in the hose to be drained off into the refuelling tank.

h. The second attendant gets the final dip reading.

i. Dispenser/operator lets go the trigger, wraps the nozzle with absorbent pad and secures the nozzle above ground level. Once the nozzle is temporally secured, he/she closes the tidy tank lid.

j. The hose is then recoiled, with dispenser nozzle secured above ground level and ready for next day.

k. Site supervisor locks the dispensing valve.

3.2 Fuelling of the Tidy Tanks

The two fuel handlers assigned for the task at the morning meeting shall ensure that:-

a. The dispenser/operator uncoils the hose and stretches the hose towards the refilling tanks.

b. Dispenser/operator secures the dispenser nozzle into an empty 205 drum and opens the lid of the tidy tank.

c. Inserts the dispensing nozzle into opening and asked the second attendant to open the dispensing valve.

d. The second attendant opens the valves and keeps it open until asked to turn it to off.

e. The dispenser/operator squeezes the trigger with his/her fingers and allows the fuel to drain in to the tank. Checks the tank level regularly.

f. When fuel approaches the 85% level, he/she informs the second attendant to close the valve. This will allow for all the fuel still in the hose to be drained off into the refuelling tank.

g. The dip reading is taken.

h. Dispenser/operator lets go the trigger, wraps the nozzle with absorbent pad and secures the nozzle above ground level. Once the nozzle is temporally secured, he/she closes the tidy tank lid.

i. The hose is then recoiled, with dispenser nozzle secured and ready for next refilling task.

3.3 Fuelling of 205 Litre drums for Tents and Core Shacks

The two fuel handlers assigned for the task at the morning meeting shall ensure that:-

a. The dispenser/operator uncoils the hose and stretches the hose towards the refilling drum.

b. Dispenser/operator secures the dispenser nozzle into an empty 205 drum and opens the lid of the tidy tank.

c. Inserts the dispensing nozzle into opening and asked the second attendant to open the dispensing valve. (***Note that this storage container (205 L) is laid horizontally and therefore extra care has to be taken during refuelling process).***

d. The second attendant opens the valves and keeps it open until asked to turn it to off.

e. The dispenser/operator squeezes the trigger with his/her fingers and allows the fuel to drain in to the drum. Stop occasionally and visually check for the fuel level.

f. When fuel approaches the 85% level, he/she informs the second attendant to close the valve. This will allow for all the fuel still in the hose to be drained off into the refuelling tank.

g. Dispenser/operator lets go the trigger, wraps the nozzle with absorbent pad and secures the nozzle above ground level. Once the nozzle is temporally secured, he/she closes the drum lid to allow exchange of air. This aids in release of fuel to the stove burner located inside the tent.

h. The hose is then recoiled, with dispenser nozzle secured and ready for next refilling task.

i. If the drip tray has water or the absorbent pad is soaked with fuel, remove the contaminated water and pad and disposed off as per waste management procedures.

3.4 Fuelling of the Float Planes

The refuelling of the chartered float planes is the responsibility chartered company and its pilots. However, since the refuelling activity will be done on our property, the following measures shall be in place in to ensure prevention of any spill during this process.

The Site Supervisor shall ensure that:-

a. The required numbers of 205 L Jet B drums requested by the pilots are delivered to the beach. No drums should be rolled onto the jetty without the permission of the Site Supervisor.

b. Emergency response equipment (a Spill kit & a Fire extinguisher) shall be made available. Particular importance should be given to bringing in a packet of white booms.

c. Fuelling of the float plane should be done only after all other activities (loading and unloading) are completed.

d. When all clear is given by the pilot to refuel the plane, a drum is rolled on to the jetty and made to stand upright into a secondary containment area. If no such facility is available, sufficient absorbents pads should be place under the drum to cover at least an area greater the drum base.

e. Place the electric hand pump into a secondary containment tray before operation.

f. Ensures all hoses are connected properly before proceeding with dispensing of the fuel.

g. A nozzle disperser attendant (pilot-1) stays with the nozzle until the task is completed.

h. The second attendant (pilot-2) operates the pump.

i. Once filled, use absorbent pads to remove any fuel on the nozzle and the siphon dip before storing away the equipment.

j. Ensure drum lid is securely fastened before removing from jetty. Pump, empty drum and used absorbent mats are removed from the jetty and the waterfront.

3.5 Fuelling the helicopters

The refuelling of the helicopters is the responsibility chartered company and its pilot and the engineer. However, since the refuelling activity will be done on our property, the following measures shall be in place in to ensure prevention of any spill during this process.

The Site Supervisor shall ensure that:-

a. The required numbers of 205 L Jet B drums requested by the pilots are delivered to the helipad. No drums should be rolled onto the helipad without the knowledge of the Site Supervisor.

b. Emergency response equipment (a Spill kit & a Fire extinguisher) shall be made available at location.

c. Fuelling of the helicopter should only take place when all clear is given by the pilot. A drum is rolled onto the pad and made to stand upright. Due to the nature of the operation, no loose or light material should be allowed near the helicopter.

d. Ensures all hoses are connected properly before proceeding with dispensing of the fuel.

e. A nozzle disperser attendant (pilot-1) stays with the nozzle until the task is completed.

f. The second attendant (engineer) operates the pump.

g. Once filled, use absorbent pads to remove any fuel on the nozzle and the siphon dip before storing away the equipment. ONLY DO THIS WHEN THE ENGINE IS SWITCHED OFF.

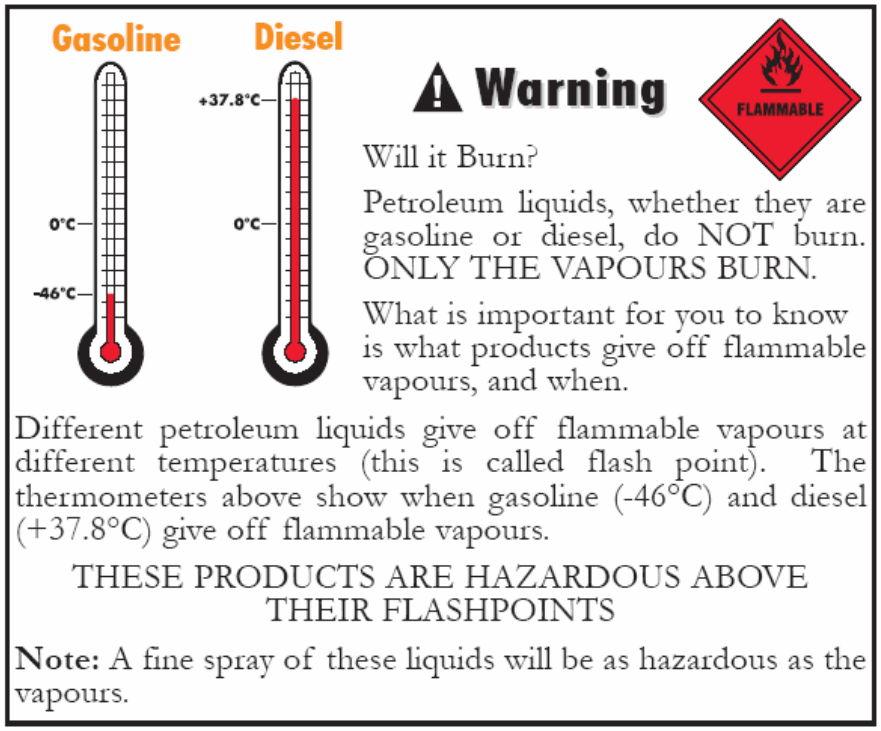
h. Ensure drum lid is securely fastened before removing from the pad.

4 TRAINING

The Site Supervisor is responsible for providing fuel handling and dispensing training. All employees working at Miramar Hope Bay Limited project sites responsible for fuel handling shall receive training on proper procedures. After the training is conducted, the employee must demonstrate they can perform this work safely and competently, eliminating the risk of spills before being permitted to perform this work anywhere within the belt. The supervisor in charge of the employee is responsible to ensure this training is completed. A list of the tasks is provided in Appendix A.

5 FUELLING FACTS

Gasoline and diesel fuel can be extremely dangerous unless properly and safely handled. These are some of the characteristics and hazards of fuel that every employee should know:



Vapour Flow

Heavier than air – hugs ground – displaces air.
May cause asphyxiation.
May explode if exposed to a source of ignition.

Note: A fine spray or mist of a flammable liquid is as hazardous as a flammable vapour.

Product Flow

Flows on the ground surface and floats on water.
Spills can travel through the ground, contaminate drinking water and seep into buildings.

First Aid

Wash contaminated skin with soap and warm water.
Do not use hot water.
Flush eyes with water.
If an individual is overcome by vapours remove them to fresh air.
Do not induce vomiting.
Obtain medical attention.

Toxicity

Vapours are moderately irritating to the respiratory passages. The liquid when accidentally aspirated into the lungs can cause severe inflammation of the lungs. Excessive exposure to benzene may cause leukemia.
Flammable liquid.
May cause cancer.
Vapours are moderately irritating to the eyes.
Prolonged immersion in liquid may lead to chemical burns.

6 EMERGENCY PREPAREDNESS

Spills of chemicals, fuels and other substances may occur as isolated events or they may occur with other emergencies such as fire, explosion, natural causes or accident. The accuracy and urgency in disseminating information to your immediate supervisor and Site Supervisor is crucial to the success of the prevention or recovery process in any accident/incident.

6.1 First Responders

In the event of any leak, spill or system failure, steps taken by employees at the spill site are as follows:

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

b. Assess the hazard to persons in the vicinity of the spill, leak or failure system. If the risk of gas fumes exits or if fire or explosion hazards are perceived, leave the area immediately and warn co-workers to leave also.

c. Assess nature and status of the spill, leak or system failure and measures to be taken to bring the situation under control.

d. Remove any source of ignition.

e. When safe to do so, stop the flow of the spilled material.

f. Cleanup spill using absorbent material located on location.

g. Notify your Supervisor immediately.

h. If First Aid is warranted, notify on-site Medic immediately. The Medic then activates the MediVac Emergency procedure protocol.

i. Wait for further instructions from your supervisor.

j. Record all information on the status of the situation. Take photographs of the site (if possible) before the clean up and subsequent to clean up.

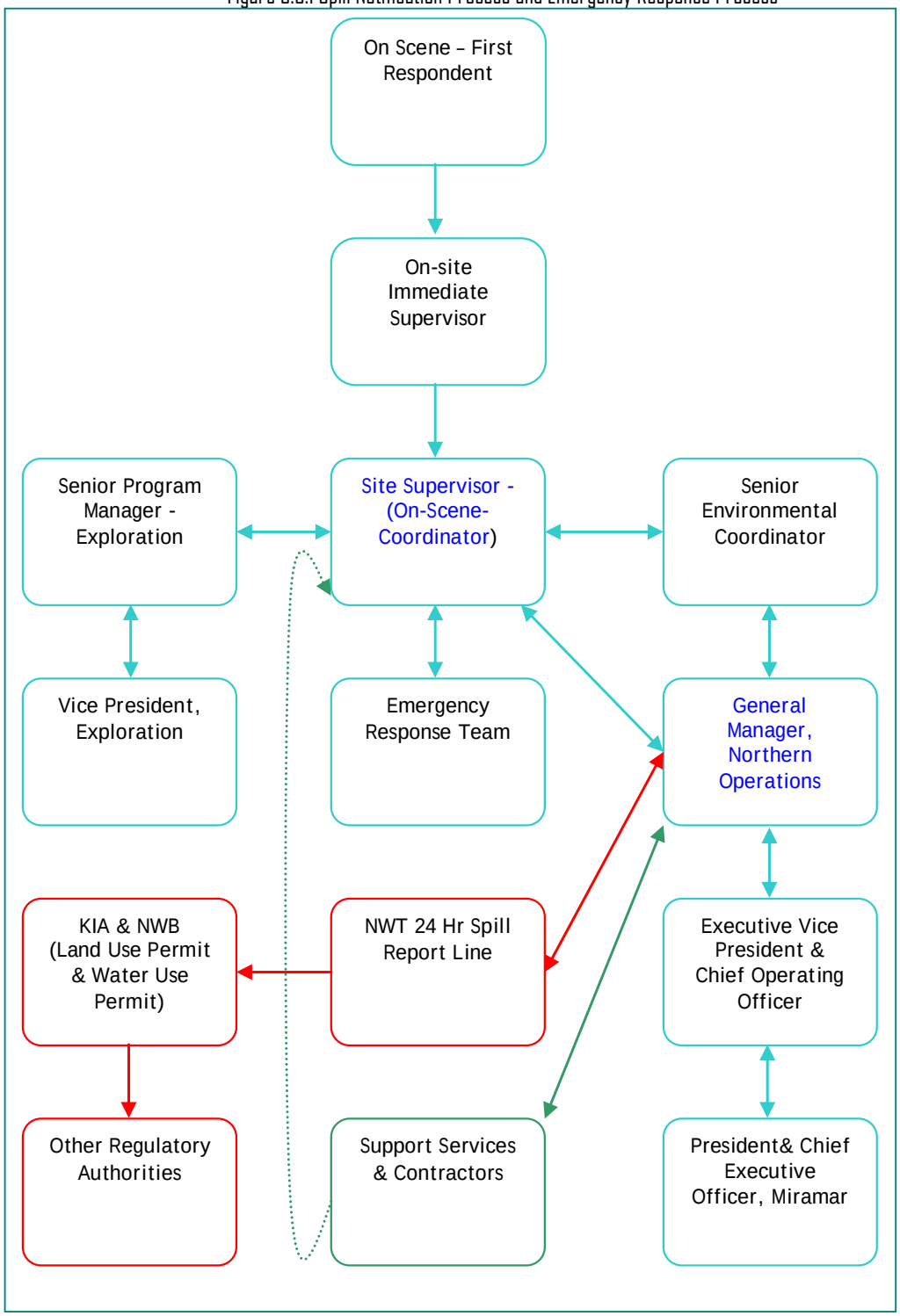
6.2 On Scene Spill 24-hours Notification Process

The key personnel involved during a spill occurrence and the reporting responsibilities are illustrated in the following chart below. The responsibilities of each of these positions are discussed in Section 5 of the Spill Contingency Plan document.

6.3 Line of Communication Responsibility and Accountability:

The effectiveness in the implementation of the management Plan during an unexpected environmental incident depends on key MHBL site management knowing of their respective roles and the effectiveness in dissemination of information. The communication chart illustrated in Figure 6.3.1 outlines the channel of communication for both within (aqua colour) MHBL and externally (regulatory - red & contractors - sea green colours). Positions highlighted in blue are responsible for dissemination of information, provide onsite directives and the general management of the clean up operations of an unexpected environmental incident.

Figure 6.3.1 Spill Notification Process and Emergency Response Process



7 APPENDIX – FUEL HANDLING TRAINING

7.1 MHBL Fuel Handling Training Record Sheet

Name		Department	
Date of Training		Location of Training	

All employees responsible for fuelling equipment, transferring fuel, and filling tanks of any size must demonstrate that they can perform this work safely, eliminating the risk of spills. The employee must demonstrate that he/she can competently perform each task listed below before being permitted to perform this work anywhere within the belt. The supervisor in charge of the employee is responsible to ensure this training is completed.

INSTRUCTIONS – DESCRIPTION OF TASK

- ◊ The employee understands the impact of spills to the environment and company, including smallest of leaks, drips, and residuals petroleum products.
- ◊ ALL SPILLS MUST BE REPORTED IMMEDIATELY TO THE SUPERVISOR. If can be done safely without harm to the worker, all leaks must be stopped immediately to lessen the impact to the environment.
- ◊ Check pumps, hoses, valves and fittings for sign of leaks.
- ◊ Check fill hatches, inspection covers and other tanks openings for leaks.
- ◊ Check tanks to ensure they are free from rust and in good repair.
- ◊ Identify maximum levels for filling tanks to compensate for fuel expansion. DO NOT FILL GREATER THAN 85%.
- ◊ Ensure that the filling process is always monitored constantly to prevent overfilling and spilling. In all cases, when filling larger tanks, 2 people will be required to perform the job. The dispenser valve has to be opened by the Site Supervisor and locked after use immediately.
- ◊ Any tank accidentally overfilled must be reported to the supervisor immediately.
- ◊ Ensure valves, hoses, and pumps are protected from damaged.
- ◊ Eliminate any chance of accidental siphoning (i.e. keep fuel nozzles stored about the tank connection, turn pumps off when not in use).
- ◊ Ensure filling hoses and nozzles are kept within the containment areas where possible. Do not have them hanging outside the containment area where a spill could occur.
- ◊ Inspect tidy tanks and 45 gallon fuel drums are properly secured to platforms and stands.
- ◊ Inspect all platforms and stands to ensure that they are in good condition.
- ◊ Follow fire safety procedures (no smoking, no open flame within 7.5 meters). Fire extinguishing equipment must be in place at every supply or filling area.
- ◊ Ensure proper absorbent material is placed under valves, tanks, nozzles, and other potential leak areas.
- ◊ Absorbent material is changed often as it reaches its maximum limit for absorbing petroleum products. Oil soaked pads must be properly disposed of. Check with supervisor for proper method.

- ◊ Containment areas are inspected frequently for damages, erosion of fill material, snow falls and leaks.
- ◊ Containment areas including drip trays must be kept clean of debris and water at all times.
- ◊ The supervisor must authorize the pumping of water from any containment area or drip tray. Any contaminated water may have to be properly treated before releasing to the environment.
- ◊ Spill containment material must be inspected regularly to ensure there is sufficient material to deal with emergencies. Spill kits must be properly marked and kept in designated areas.
- ◊ Any fuel being transported must have lids, caps and valves closed tightly and where necessary locked.
- ◊ Site supervisor is responsible for removing locks removed from valves, covers and other tank openings for the purpose of fuelling, filling or maintenance must be re-secured when job is completed.
- ◊ Waste oil stored in drums must be inspected regularly and kept upright to prevent accidental spillage. Bungs must be tightly secured.
- ◊ 45-gallon drums of petroleum product must be stored in a safe area where they will not leak or drain into any water body or come in contact with mobile equipment accidentally.
- ◊ Fuel drums must be stored so that proper inspection for leaks can be made of all sides of the drum.
- ◊ Contents of the product line, tanks, pumps and valves must be clearly identified.
- ◊ Safe access to fuel storage and valves must be clearly identified.
- ◊ Emergency procedures.
- ◊ Emergency equipment location at sites.
- ◊ If in doubt, STOP, check with the supervisor in charge.

Name:		Signature:	
Designation:		Date:	

TRAINER: *This employee has received training as listed above and has demonstrated his/her ability to perform all tasks in a safe and efficient manner.*

Name:		Signature:	
Designation:		Date:	

SUPERVISOR: *I am confident that all training was completed as prescribed above and this employee has demonstrated his competency to the trainer in the handling, and storage of fuel on site.*

Name:		Signature:	
Designation:		Date:	

EMPLOYEE: I have received training in the handling and storage of fuel on site, and responsible for following all instructions that I have been given

7.2 MHBL Fuel Storage Facilities Checklist

Fuel Storage Facilities Checklist

WEEKLY /MONTHLY INSPECTION PROGRAM - Hope Bay

This checklist will be completed once every calendar month. All spills and potential spills must be responded to IMMEDIATELY.

Daily inspections will be competed for fuel spills and potential fuel spill conditions. Daily inspections will be recorded in the Daily Fuel Storage Facility Inspection Logbook.
This document will be forwarded to the Safety and Environmental Departments for review and filing. All inspections are subject to audit.

SELECT ONE: ☐ Weekly Inspection ☐ Monthly Inspection

TANK LOCATION: _____ TANK #_____

		YES	NO
1. FIRE PREVENTION	1.1 Fire extinguishers are located nearby.		
	1.2 Fire extinguishers are sufficient to comply with regulations.		
	1.3 General area is free from waste material and weeds.		
	1.4 No ignition sources are within 3 meters of tank (s)		
2. ON/ABOVE GROUND EQUIPMENT	2.1 Tank fill points are accessible and clearly identified.		
	2.2 Handrails are safe and in good repair.		
	2.3 Ladders are safe and in good repair.		
	2.4 Tank is free from rust and in good repair.		
	2.5 No visual evidence of product leaking from the INSIDE OR OUTSIDE tank. DO NOT ENTER TANK UNLESS APPROVAL HAS BEEN GRANTED!		
	2.6 Catch containment (s) clean of water, snow, ice and debris.		
	2.7 Catch containment (s) are in good repair.		
	2.8 Tank (s) not filled more than 85% total capacity.		
	2.9 Spill kits are in place and in good condition.		
	3.0 No evidence of leaks from fittings, lines and pump		
3. WATER DRIPPING	3.1 Storage system has been checked for water in the last month.		
	3.2 Excess water has been drained in the past month.		
4. STOCK ROTATION AND STORAGE	4.1 Fuel has been dipped to ascertain unexpected loss		
	4.2 Fuel has been drawn from each tank this month.		
	4.3 Drums of product are stored safely.		
5. TANKER ACCESS	5.1 Safe access to the fuel storage area.		
6. SECURITY	6.1 Access to pump is locked		
7.SIGNAGE & PROCEDURES	7.1 Contents of the product lines, tanks, pumps and valves are clearly identified.		
	7.2 All employees' are familiar with spill response procedures.		

Date: ____/____/____ Name: _____ Signature: _____

MIRAMAR HOPE BAY LTD.