



# Explosives Management Plan Doris North Project, Nunavut

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## **1.0 INTRODUCTION**

### **1.1 Plan Purpose**

This Explosives Management Plan provides pre-construction information on how explosives will be transported, stored and used in an environmentally sound manner at the Miramar Hope Bay Ltd (MHBL) Doris North Project (Doris North) in Nunavut. It is intended to provide MHBL staff with an overview of how explosives are to be stored and managed at the Doris North site to ensure protection of the surrounding environment.

This Management Plan is a component of the Environmental Management System and is intended to communicate key information on how explosives are to be managed on site to prevent adverse environmental impacts. It is not intended to provide detailed information on the safe use and handling of explosives. A list of references is provided in Section 1.3 to provide the reader with this type of information.

This Plan is a “living document” and will be reviewed and updated periodically during the mine life to ensure that site experience with explosives management procedures are captured and shared amongst all operating staff (adaptive management).

This Management Plan will be updated after the water license has been issued to incorporate any new commitments made by MHBL during the license process and to incorporate any conditions contained within the water license relating to the handling and management of explosives at the Doris North Project. 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 Explosives Management Plan 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.

### **1.2 Site Location and Overview**

Doris North is located on the Canadian mainland in the West Kitikmeot region of Nunavut approximately 125 km southwest of Cambridge Bay and 75 km northeast of Umingmaktok. The Project is located on Inuit Owned Land at 68 09’ N x 106 40’ W, 5 km south of the head of Roberts Bay, an extension of Melville Sound which connects with Bathurst Inlet about 80 km west of the Project.

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.).

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 in a marine sealift to Roberts Bay. Explosives and other hazardous supplies will be shipped in sea-can containers, which will be offloaded from the barges and trucked to their storage locations at the mine site.

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 for use by certified mine personnel in mine development. Some specialty packaged explosives will be used for specific blasting needs such as controlled wall blasting where needed and for wet conditions, if they are encountered. All explosives and detonators will be transported, stored and used on-site in an approved manner (under the Nunavut Explosives Use Act and the Nunavut Mine Health and Safety Act and Regulations) by trained and licensed MHBL personnel.

### **1.3 Cross Reference to MHBL Plans Cited in the Explosives Management Plan**

This Explosives Management Plan should not be taken as a stand alone sole source of information on the safe handling, storage and use of explosives at the Doris North site. It is intended to be one component of the Doris North Environmental Management System and focuses on how explosives should be stored and used on site to minimize any potential environmental impact resulting from the presence and use of these explosive agents on site. The reader is referred to other documents for specific information on safe handling procedures, specifically:

1. MHBL's Storage and Handling of Explosives safety procedure (Ref # 05-015.2) dated December 13, 2006 (Copy included as Appendix A);
2. The Canadian Explosives Act ;
3. Explosives Use Act ;
4. Mine Health and Safety Act (Nunavut); and
5. Mine Health and Safety Regulations (Nunavut).

### **1.4 Regulations Governing Explosives Use**

Control and use of explosives are covered by federal and Nunavut regulations:

- *Transportation of Dangerous Goods Act*
- *Canada Explosives Act and Regulations*
- *Canada Transportation Act, Ammonium Nitrate Storage Facilities Regulations*
- *Northwest Territories/Nunavut Mine Health and Safety Act and Regulations*
- *Nunavut Explosives Use Act*
- *Consolidation of Explosives Regulation.*

### **1.5 Location of Facilities**

Explosives storage and handling facilities are listed in Table 1-1 together with their locations which are shown on Figures 1-1 and 1-2.

**Table 1-1: Explosives Storage and Handling Facilities**

Facility	Location
Initial Construction Period	
Ammonium Nitrate	No ammonium nitrate use planned during the construction phase
Diesel Fuel	No diesel fuel will be required for ANFO manufacture during the initial construction phase
High Explosives – Packaged stick powder	Stick powder (high explosives) will be stored in an explosives magazine located in a sea-can container to be stored at the temporary explosives storage area during the first winter construction period
Blasting Caps	Blasting Caps will be stored in a cap magazine located in a sea-can container at the temporary explosives storage area during the first winter construction period
Operational Period	
Ammonium Nitrate	In 1-tonne tote bags to be stored in sea-can containers to be stored at the permanent explosives storage facility
Diesel Fuel	Diesel fuel will be stored at the mill site fuel tank farm and transferred on an as required basis by tank truck to a self-bermed day tank to be located within the ANFO mixing plant at the permanent explosives storage facility
High Explosives – Packaged stick powder	Stick powder (high explosives) will be stored in an explosives magazine located in a sea-can container at the permanent explosives storage facility
Blasting Caps	Blasting Caps will be stored in a cap magazine located in a sea-can container at the permanent explosives storage facility

At the outset of construction there will be a need to temporarily store packaged explosives and detonators (stored in separate magazines with appropriate separation) until the permanent storage facility rockfill pad is constructed. During the initial construction period (first construction winter) only packaged explosives (stick powder) will be used. Consequently there will be no storage of ammonium nitrate or diesel fuel (to manufacture ANFO) stored at this temporary explosives storage area.

This temporary facility has to be sited a safe distance away from the planned quarrying activities in Quarry 1 and from the mill site. Consequently a temporary explosives storage area will be developed on a rockfill pad to be constructed as a widening of the Roberts Bay access road at the north end of the planned airstrip in the second quarter of 2007 (See location on Figure 1-1). This temporary site will be accessed via the Roberts Bay access road and will support early construction starting at Quarry 1 in preparation for the arrival of the sea lift barge in the summer of 2007. It will be used until the permanent explosives storage facility pad can be constructed in the winter of 2008 at which time all explosives will be transferred from this temporary site to the permanent site. The temporary site rockfill pads will then become part of the airstrip. Consequently this temporary site will “disappear” in early 2008 and is solely required to allow explosives to be securely stored for a short window of time while the permanent storage location is constructed of quarried rock. The temporary site will be “cleaned” to ensure that no residual explosives are left at the temporary site to prevent spring snowmelt runoff from potentially carrying such material into local water courses.

Explosives will be permanently stored in separate Type 4 powder and detonator magazines at the permanent explosives storage facility to be sited 760 m northwest of the camp (see Figure 1-1 – DWG. G-02), and accessed by a spur road from the main all-weather road coming from Roberts Bay. The detonator magazine will be 275 m off the main road, which will ensure that it is tucked in behind a rock outcrop effectively shielding it from view to the mill and campsite. The powder magazine will be located on the same road 100 m beyond the detonator magazine.

## **1.6 Product Description**

The explosive material categories, site handling and storage requirements, and personal protective equipment for the explosive agents planned for use at the Doris North Project as recommended by the product manufacturers' Material Safety Data Sheets (MSDSs) are summarized in Tables 1-2 through 1-4.



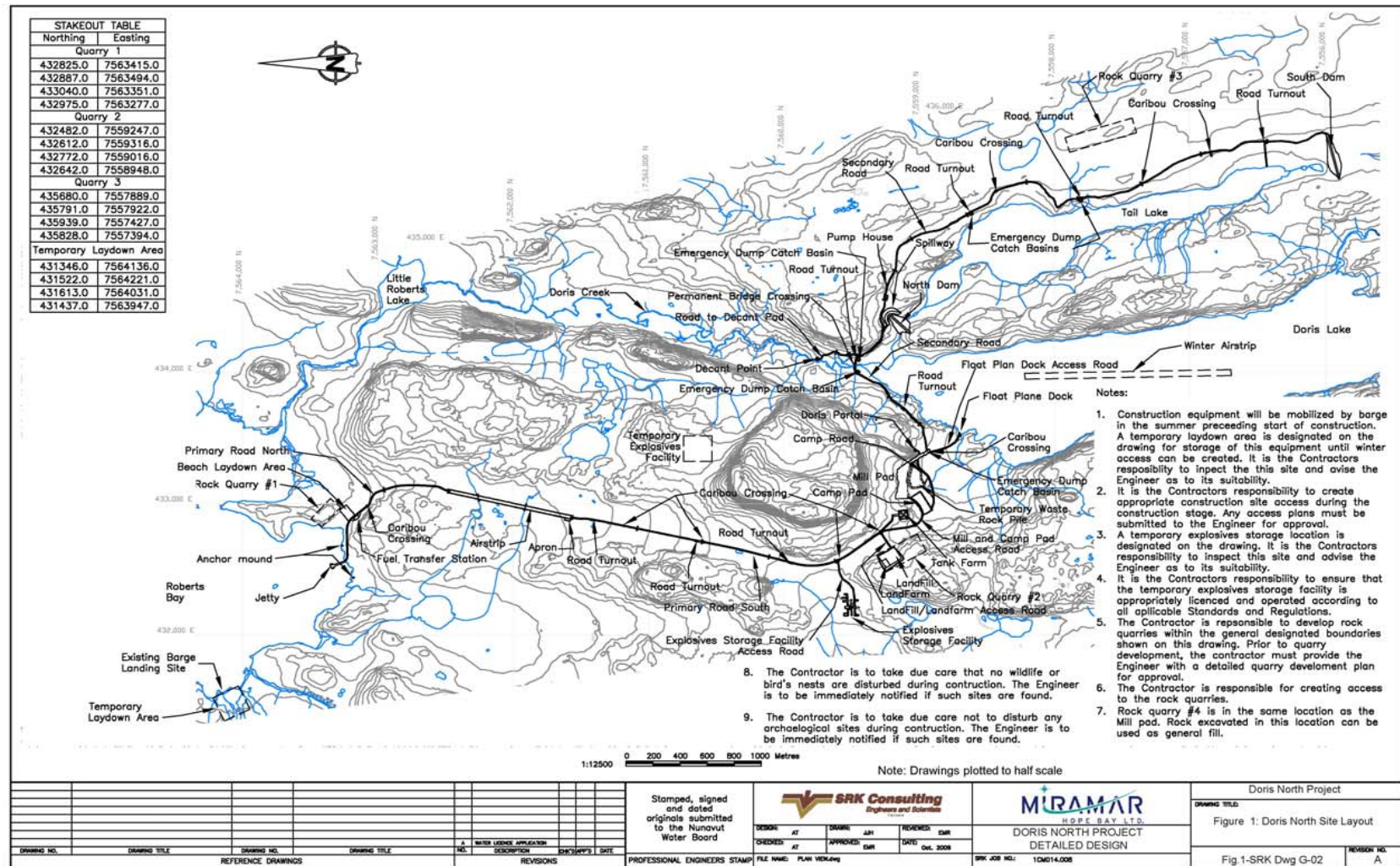
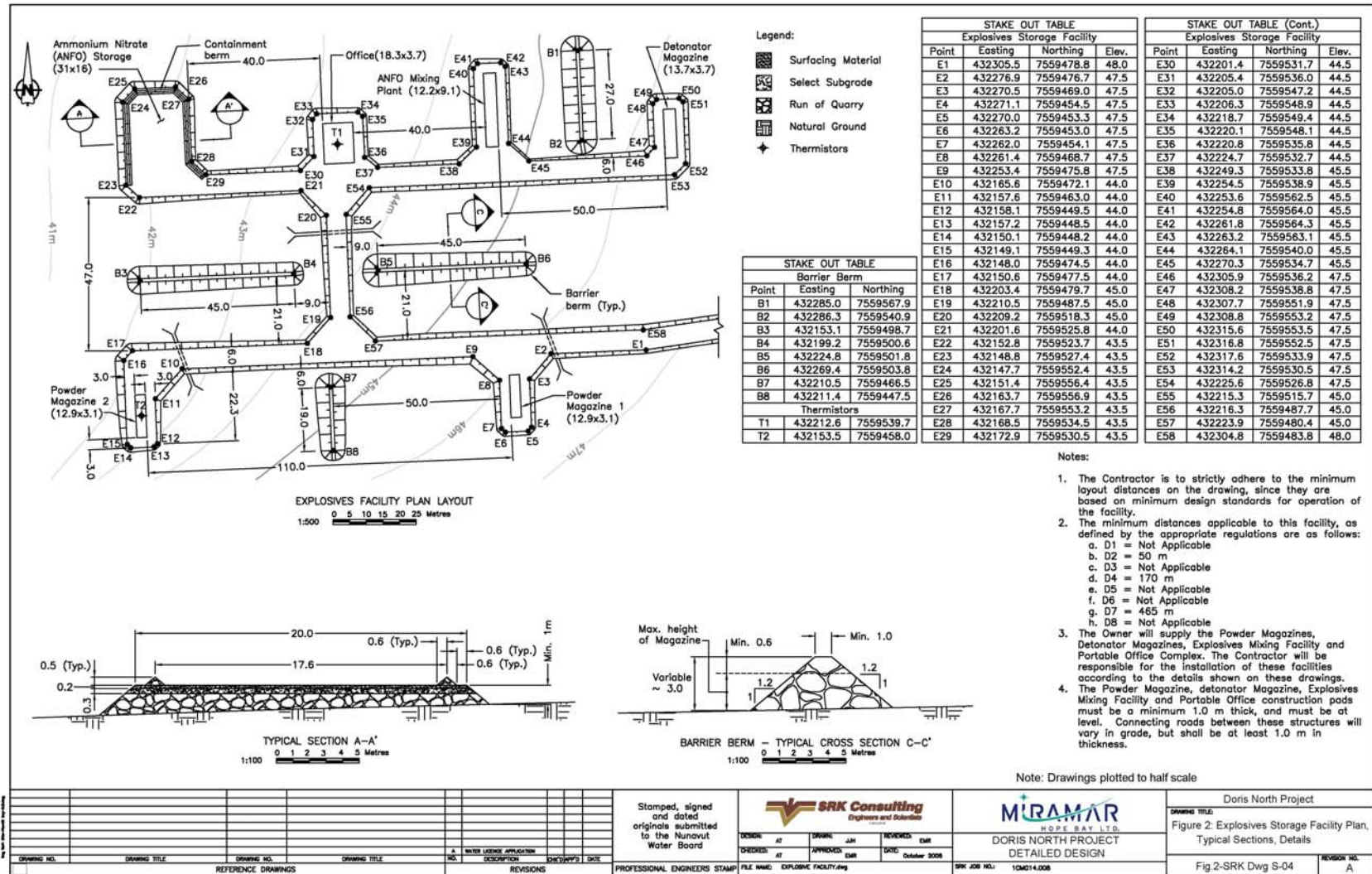


Figure 1.1: Doris North Site Layout Showing Location of Temporary and Permanent Explosives Storage Facilities



**Figure 1.2: Explosives Storage Facility Plan, Typical Section, Details**

**Table 1-2: Hazard Classes and Potential Impacts**

Material	Class	Potential Impact
Ammonium nitrate	5.1	Water contamination
Packaged High explosives stick powder	1	Negligible with proper handling
Blasting caps	1	Negligible with proper handling

**Table 1-3: 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 (stick powder)	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.

**Table 1-4: 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
Packaged High explosive (stick powder)	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

## 1.7 Doris Mine Blast Management Organization

The proposed blast management organization at Doris North (top to bottom) will be:

- Mine General Manager – overall responsibility for the Doris North Project
- Mine Engineer – responsible for mine design and operation
- Mine Supervisor – responsible for day to day operations supervision
- Blast Supervisor – responsible for all blasting activities and explosives
- Blasters – certified mine personnel who carry out blasting

## **2.0 EXPLOSIVES MANAGEMENT**

Explosives management at Doris North will focus on two goals, both equally important:

- safety; and
- environmental stewardship.

Manufacture of ANFO will be contracted out by MHBL to a qualified blasting contractor who will mix ammonium nitrate and fuel oil in a contractor-supplied mixing building and deliver the ANFO underground for use by certified mine personnel in mine development. This activity will be conducted under an explosives plant license to be obtained by the contractor on behalf of MHBL from the Explosives Division of Natural Resources Canada under the Canadian Explosives Act.

All explosives manufacturing, storage and product delivery systems will be approved and subject to inspection under *Part IV – Explosives at Mines* of the *Northwest Territories/Nunavut Mines Health and Safety Act and Regulations* and under federal regulations (The Canadian Explosives Act) administered by Natural Resources Canada, Explosives Division. The explosives supplier and on-site contractor will be licensed and permitted to operate at the Doris Mine.

MHBL personnel will conduct weekly inspections of the explosives storage and manufacturing facilities as laid out in the MHBL “Storage and Handling of Explosives Procedure”. In addition MHBL on site environmental staff and/or third-party consultants will perform periodic safety and environmental audits of these facilities. Doris North mine management will have the overall responsibility for planning, use and management of explosives at the mine site.

### **2.1 Safety**

#### **2.1.1 Safe Distances**

The explosives magazines must be a minimum distance from camp. To address this requirement, the permanent explosives magazine pad will have a setback of 760 m from the camp. A significant rock outcrop is in the direct line of site between the explosives magazine area and the camp and other plant site buildings, providing additional safety buffering. MHBL has consulted with Natural Resources Canada over these setback distances and is of the opinion that they meet all appropriate guidelines and regulations.

#### **2.1.2 Restricted Access**

Access to the magazines will be restricted to authorized personnel only and log books will be kept in each magazine for tracking purposes as laid out in the MHBL “Storage and Handling of Explosives Procedure”. The magazines will be supplied and permitted by the explosives supplier. Authorized personnel will be persons holding a Blasting Certificate or Provisional Blasting Certificate that is issued in accordance with *Part VII* of the *Mine Health and Safety Act and Regulations*.



### **2.1.3 Notification**

Blasting for construction will take place approximately daily when rock is quarried. The Blasting Supervisor will advise the Mine General Manager at the daily morning management meeting if a blast will occur that day. Warning signs will be placed appropriately on access roads indicating the time of the blast. A warning will be transmitted on the mine radio watch frequency one hour, 30 minutes and 15 minutes before the blast. Prior to detonation, the Blast Supervisor will ensure the area is cleared of people and animals to a distance of 600 m from the blast centre and guards placed on access roads. A warning siren will be sounded two minutes before the blast. Following the blast, the Blasting Superintendent will inspect the blast area to ensure all explosives have detonated. Once the superintendent is satisfied the blast site is safe the all clear will be sounded and transmitted on the mine radio watch frequency.

For underground blasting, the procedure will be similar except that underground mine workings will be inspected for personnel prior to the blast and all underground personnel accounted for prior to detonation. An underground tag system will be in place to ensure that no one goes underground without notification.

### **2.1.4 Adverse Weather**

Adverse weather precautions will apply to quarry blasting. During adverse weather conditions the Blast Supervisor will notify the Mine Supervisor of the precautions to be taken. In the event of electrical storms, the blast site will be evacuated and no blasting connections will be made.

Except in extreme weather conditions, underground blasting operations are not anticipated to be affected.

### **2.1.5 Misfires**

Reporting and handling of misfires is defined in Section 14.56 of the *NWT/Nunavut Mine Health and Safety Act and Regulations*. All misfires will be documented in a logbook kept for the purpose by the blasting supervisor and periodically reviewed by the engineer.

When a misfire has been identified it will be treated as a loaded hole until made safe. A blast sign and markers will be placed at the hole as required by the regulations. The misfire will be made safe by an authorized person and the misfire and follow up logged. The authorized person will date and sign the log book. The engineer will use the survey location and log book information to correlate the incident to ground conditions, blast design or product quality issues.

## **2.2 Environmental Management**

### **2.2.1 Permanent Explosives Storage Pad**

The permanent explosives storage area pad will be constructed of sized fill and include a berm surrounding the explosives and detonator storage magazines and the mixing plant.

## **2.2.2 Ammonium Nitrate**

### **2.2.2.1 Properties**

Ammonium nitrate (AN) is a stable, inorganic, solid compound. It is completely soluble in water and must be kept dry to remain effective for its intended purpose. AN products vary in composition, blend, and surface treatment. For instance, granular fertilizer products are coated with various materials to seal the particles from moisture contamination, whereas AN prills (pellets) produced for use in ANFO explosives are intentionally porous to permit the diesel fuel oil to be absorbed. The prills are generally white or off-white, and shelf life in a tightly closed container is unlimited.

AN itself is not an explosive, but it is an oxidizer and can explode or decompose under specific conditions, such as: high temperature (between 160°C and 200°C); bulk storage in a confined space; contamination with organic substances such as oil or waxes; contamination with inorganic materials such as chlorides and metals (chromium, copper, cobalt, nickel); and exposure to strong shock waves from other explosions. Similarly, AN is not combustible in itself, but as an oxidizing agent it increases fire hazard when in contact with other combustible materials, even in the absence of air. AN must be stored in a dry, well-ventilated area away from all possible sources of heat, fire, or explosion.

AN is odourless under normal conditions but releases toxic nitrous and ammonia fumes on explosion, decomposition, or involvement in a fire. Direct, unprotected contact with dry AN can cause discomfort and inflammation of eyes, skin, and respiratory membranes. Its oral toxicity is slight to moderate, although swallowing large amounts can have serious, if not fatal, effects from the ammonia and nitrate salts. It has no known chronic effects, however, and repeated or prolonged exposure is not known to aggravate pre-existing medical conditions.

AN is of low toxicity to aquatic life but may promote eutrophication in waterways (water becomes over-rich in dissolved nutrients). AN dissociates to ammonia in water and ammonia at high enough concentrations (dependent on temperature and pH) is toxic to fish. For more information on ammonium nitrate, see the MSDS in Appendix B and recommended handling procedures summarized in Appendix C.

### **2.2.2.2 Handling and Storage**

Although AN is classified as a hazardous product, its storage and handling at Doris North is not considered to be a significant risk activity. The amount of ammonium nitrate used at the Doris North site is relatively small (approximately 700 tonnes) as compared to the other open pit mining operations in the Northwest Territories and Nunavut. The ammonium nitrate will be delivered in the form of prills (small pellets or briquettes designed to reduce potential dusting) and be packaged within waterproof plastic tote bags (one tonne tote bag) that are then packed inside steel sea-can containers. The ammonium nitrate will remain in these steel shipping containers throughout their trans-shipment from the supplier to the Doris North site and while the ammonium nitrate remains in storage at the permanent explosives storage area. The ammonium nitrate bags will only be removed from the shipping containers when the ammonium nitrate is needed to produce ANFO at the explosives

mixing plant. The bags will be handled individually when needed for the preparation of batches of explosive. Consequently any potential breakage of bags in handling is minimized by keeping the bags within the shipping containers and all potential spillage is constrained to inside these shipping containers. The risk of spillage is thus restrained to the period when the bags of ammonium nitrate are being transferred to the explosives mixing plant at the permanent explosives storage facility.

At site, explosives will be handled and managed by MHBL personnel qualified and trained in safe handling procedures and in accordance with applicable legislation and regulations.

The proposed permanent explosives storage facility has been located away from any receiving water bodies. Consequently MHBL is confident that any spillage of ammonium nitrate can be kept away from water course where risk of environmental harm is at its greatest. Any spillage that is not quickly recovered by shovel will tend to be adsorbed by the rockfill pad at the explosives storage facility and will wash out slowly onto the nearby tundra where it will be adsorbed as fertilizer by the surrounding vegetation. The potential flow path to Doris Lake is quite long (over 1,000 meters) and consequently MHBL is confident that all ammonium nitrate not recovered at the pad will be adsorbed by the vegetation before being transported to Doris Lake (the nearest water body). In the unlikely event of a larger spill outside the permanent storage facility where the risk of potential transport of spilled ammonium nitrate by precipitation runoff is greater, MHBL will immediately deploy temporary silt curtains in the water path to prevent prills being carried into nearby water courses while the spill is cleaned up.

All ammonium nitrate spills will be swept up and placed in suitable containers to be recycled in the preparation of ANFO. Typically empty bags are not considered to be hazardous waste. However to prevent the uncontrolled release of fine AN material (that may be coating the inside of the bags), the empty bags will be shaken clean at the point of use so that the AN is contained within the explosives mixing plant. The residue shaken from the bags will be recovered and used to make ANFO. The empty bags will then be burned in the burning pit at the site's non-hazardous landfill area. This will prevent the empty bags from being used for other purposes as a precautionary measure.

All personnel exposed to AN will wear suitable personal protective equipment.

### **2.2.3 Packaged High Explosives and Blasting Caps**

The permanent explosives magazines will be located on a 2.0 m thick pad with surface areas of approximately 600 m<sup>2</sup> and 430 m<sup>2</sup> for the detonator and powder magazines, respectively. Both magazines will be designed to Type 4 magazine standards, as outlined in "*Storage Standards for Industrial Explosives*" (NRCan 1995). The magazines will be separated by berms that meet the "donor-receiver" conditions of safe storage.

Features of the Type 4 magazines are:

- steel exterior shell;
- inside each magazine all walls and floors are covered with 20 mm plywood fastened with counter-sunk non-sparking fasteners;
- interiors are marked with stacking limit lines; and

- access is by a laminated door with high security locking hardware.

The magazines will be dedicated to storing high energy explosives and blasting caps. Caps and high explosives will be stored in separate magazines as required by the regulations. All of the explosives that are stored in the magazines will be clearly labelled. Inventory will be used on a first-in, first-out basis to ensure quality control and prevent degradation due to cold weather storage.

#### **2.2.4 Transportation to Site**

All explosives for use in the underground mine will be sea lifted to site with the annual resupply for Doris North. Mine construction phase explosives will be shipped to site both by sealift and by air transport (under appropriate transport of dangerous goods regulations) and stored in the temporary explosives magazines. The mixing plant will come to site pre-built inside a shipping container by sealift.

#### **2.2.5 On-Site Handling**

Most underground mine explosives usage will be ANFO which will be batch mixed by the explosives contractor on surface in a mixing plant to be located in a sea-can container at the explosives storage facility. The ammonium nitrate and fuel oil will be batch mixed and then placed back into 25 kg bags which will then be stored inside the ANFO storage magazine at the explosives storage site. The 25 kg bags of ANFO will be moved underground by a service vehicle on a daily basis to meet daily needs. ANFO mixing will only be done by the explosives contractor.

Construction will only use packaged high explosives as the ANFO mixing plant will not yet be available on site.

#### **2.2.6 Spills**

##### **2.2.6.1 Marine Resupply**

Marine transporters are required under Federal regulation to have spill response plans in place prior to the transportation of dangerous goods in northern waters. MHBL has verified that its current marine transportation contractor (NTCL – Northern Transportation Company Limited) has a valid spill and emergency response plans covering the transport of hazardous materials, including explosives, from Hay River to Roberts Bay. Similar requirements will be enforced on any alternate marine transportation contractors that may be used by MHBL in the future.

##### **2.2.6.2 Explosives Spills at Doris North**

At Doris North spills of explosive agents could potentially occur and will be responded to as indicated in Table 2-1.



**Table 2-1: Potential Explosives Spills at Doris North and Response**

Product	Location of Potential Spill	Potential Size of Spill	Response
Ammonium nitrate	Broken bags in the explosives storage area	1000 kg or more depending on the number of bags damaged	Qualified mine personnel will clean up and salvage spilled AN prills; damaged bags will be emptied into new bags and damaged bags burned. The ammonium nitrate prills will be cleaned up using brooms and shovels and the material recovered placed in tote bags for subsequent use in producing ANFO.
	Broken tote bags in the mixing plant	Part of 1000 kg	The blasting contractor will clean up and salvage prills; damaged bags will be emptied into new bags and damaged bags burned. The ammonium nitrate prills will be cleaned up using brooms and shovels and the material recovered placed in tote bags for subsequent use in producing ANFO.
ANFO	Broken transport bags in the mixing plant	Up to 25 kg	The blasting contractor will clean up and salvage ANFO; the plant area will be completely cleaned of ANFO and damaged bags will be burned. The ANFO prills will be cleaned up using brooms and shovels and the material recovered placed in tote bags for subsequent use underground.
	Spilled transport bags on the underground delivery vehicle	25 kg or more depending on the number of bags spilled	MHBL personnel will clean up and salvage all spilled ANFO. The spill area will be cleaned up and the spilled ANFO reclaimed by the MHBL personnel. The delivery truck will be clean if required. ANFO not recovered will report to the mill with the mine muck or Minewater from where it will be transferred to the tailings containment area.
Detonators and blasting caps	Transport underground	One or more containers of products	As above.

Mine personnel involved in explosives spill response will have explosives training. All spills of explosives will be reported on the NT-NU 24-hour Spill Report Line **(867) 920-8130** (Fax (867) 873-6924 Email: spills@gov.nt.ca) and to the INAC Water Resource Inspector at **(867) 975-4298** and logged by the Doris North spill response coordinator. A copy of the NT-NU Spill Report Form for oil, gasoline, chemicals and other hazardous materials and the associated spill response form guide is attached to this Plan as Appendix D.

### **2.2.7 Housekeeping**

The magazines and mixing plant will be kept free of empty tote bags and boxes and swept clean on a regular basis. Similarly the Blasters' vehicles will be kept tidy with any empty packaging taken to the dump daily to be burned. No explosives will be allowed to be stored in the vehicles when not in use. The blasting superintendent will conduct a weekly inspection and any deficiencies will be immediately remedied.

### **2.2.8 Inventory Management**

MHBL will record daily use of ammonium nitrate and high explosives. The blasting superintendent will check the records weekly and complete a monthly reconciliation. Blasters will be responsible to ensure that all accessories and explosives are accounted for. Blasting accessories that are not used during the workday will be returned to their respective magazine and signed in. Magazine inventories will be regularly audited for accuracy. Missing or found explosives will be reported to the blasting supervisor.

### **2.2.9 Inspection**

Access to and use of explosives will be under the exclusive control of the blasting superintendent. The blasting 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 mixing plant.

### **2.2.10 Records**

The Canadian 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.

Daily reports (including the misfire log book discussed under safety above) will be kept by Blasters and the Blast Supervisors. The Blaster in charge will sign in and sign out blasting accessories from the magazines, conduct and record magazine inspections and inventory audits, acknowledge receipt of bulk product delivered under underground and complete a blast report.

The blast report will include:

- deviations from the engineered design;
- date and time of the blast; and
- names of the Blaster and helpers.

The Mine Engineer will keep files on all production blasts and only the Mine General Manager, Mine Engineer and Blast Supervisor will have access to the files.

### **2.2.11 Disposal**

Explosives identified as deteriorated or damaged will be destroyed. MHBL will develop procedures for the destruction of such material prior to the start of mining. These procedures will be developed in consultation and under the direction of the explosive supplier and incorporated into future revisions of this Explosives Management Plan. These procedures will be communicated to the appropriate mine staff and to the NWB as part of the revision to this Management Plan. Only qualified personnel holding valid blasting certificates will handle these materials. Typically, such explosives are either burned or detonated under controlled conditions. In either case, only small quantities will be disposed of in a remote location. The destruction site will be dependent on the mining stage and will be chosen by the blasting supervisor in consultation with the Mine General Manager. Normal safety precautions for blasting operations will apply.

At the final cessation of mine operations, all unused explosives will be removed from site or safely burned or detonated if small quantities.

### **3.0 POTENTIAL EFFECTS ON FISH**

Reference to Figure 1-1 (Dwg G-02) shows that Quarry 1 is adjacent to Roberts Bay and thus blasting may produce shock wave effects on fish. Shock waves cause “a rapid rise to a high peak pressure followed by a rapid decay to below ambient hydrostatic pressure” (Wright and Hopkey 1998). The drop below ambient hydrostatic pressure causes most of the negative effects on fish, which can range from damage to the swim bladder or other organs to the disruption of development and mortality of fish eggs; small fish are more susceptible than larger fish (Wright and Hopkey 1998).

There are a number of mitigative measures available to reduce the magnitude of the shock waves produced by the explosion. The most appropriate mitigation would be to reduce the total weight of explosives, or separate the total explosion into a series of smaller explosions (and weights) by increasing the detonation delay period between charges. Wright and Hopkey (1998) recommend a minimum detonation delay period of 25 milliseconds. To reduce the potential effects of explosives in Quarry 1, MHBL will implement the following measures:

- introduce a detonation delay of 500 ms between rows of explosives; and
- introduce a detonation delay of 25 ms between each charge within each row.

Based on these mitigative measures, which correspond to the guidelines outlined in Wright and Hopkey (1998), the maximum weight of explosive will be limited below levels that may potentially affect fish.

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April 2007

This report, "Explosives Management Plan, Doris North Project, Nunavut, April 2007", has been prepared by Miramar Hope Bay Ltd.

**Prepared By**

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

## **REFERENCES**

Wright, D.G., and G.E. Hopkey. 1998. Guidelines for the use of explosives in or near Canadian fisheries waters. Canadian Tech. Report of Fisheries and Aquatic Sciences 2107.

## **APPENDIX A**

### **MHBL Storage and Handling of Explosives Procedure**







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## Company Safety Procedure

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Ref # 05-015.2

**Date:** December 13, 2006

**Section:** Hope Bay Ltd.

**Subject:** **Storage and Handling of Explosives**

**Purpose:** To ensure compliance with the storage and handling of explosives

**Definitions:**

“blasting agent” includes any ammonia nitrate-fuel oil mixture, emulsion, slurry or water gel or other relatively insensitive, ammonium nitrate explosive;

“detonator” means a blasting cap or other like device used to detonate explosives;

“explosive” means any chemical compound or mechanical mixture which by fire, friction, impact, percussion, or detonation may cause a sudden release of gases of such pressure as to be capable of producing destructive effects in adjacent objects, or of destroying life and limb;

“Magazine” means a building, place or structure on the surface or underground in respect of which a permit to store explosives or detonators has been issued;

### Procedure:

#### **Explosive Magazines**

1. All explosive magazines must meet the requirements of regulations and standards made under the Canadian Explosives Act.
2. Before putting an explosives magazine into service, a permit must be issued from the chief mines inspector.
3. A copy of the explosives magazine permit must be posted inside the magazine.
4. An explosive magazine will cease to be used if the conditions under which the explosive magazine permit was issued no longer exist.
5. The storage site for an explosive magazine must be in accordance with the Quantity-Distance Table for Blasting Explosives.



6. There shall be "NO SMOKING OR OPEN FLAME" signs posted at all approaches to a magazine.
7. No person shall be permitted to smoke, take an open flame or produce sparks within 20 m of any place where explosives are stored or handled.
8. Explosives shall be kept in a magazine with "DANGER EXPLOSIVES" signs conspicuously posted at all approaches to the magazine and on each side of the magazine.
9. All explosive magazines shall be kept locked at all times except when an authorized person is present.
10. All explosive magazines shall be kept clean, dry and free from grit at all times and any spillage shall be cleaned up immediately. Where necessary, the shelves and floors shall be treated with a suitable neutralizing agent to remove all traces of explosive substances.
11. A weekly inspection will be conducted of each explosive magazine by an authorized person and the results of the inspection shall be recorded in a log book.
12. A record shall be kept of all explosives issued and received and the inventory of the magazine in a log book, and all entries shall be signed by an authorized person.
13. Explosives stored in a magazine shall be arranged in a tidy and organized manner.
14. The explosive magazine shall not contain any exposed iron or steel except in fixtures.
15. Any electrical installation within or around an explosive magazine shall be in strict accordance with the Mine Health and Safety Regulations.
16. Any heating installation within or around an explosive magazine shall be in strict accordance with the Mine Health and Safety Regulations.
17. All metal parts of a magazine or area where explosives are prepared such as framing, cladding, piping, cable armour and any electrical components shall be permanently bonded to ground in accordance with the requirements of Mine Health and Safety Regulations.
18. The ground surrounding a magazine must be kept free of all brush, timber or other combustible material for a distance of not less than 20 m from the magazine.
19. All magazines shall be so located or protected as to prevent damage by accidental impact from vehicles or falling objects.





### **Careless Acts & Prohibitions**

1. No person shall commit a careless act with explosives or detonators.
2. A person who discovers that a careless act has been committed involving explosives or detonators shall report the incident without delay to his or her supervisor, who shall report the matter without delay to the General Manager, Northern Operations.
3. The manager shall immediately upon notification make a verbal report of a careless act involving explosives or detonators to the Chief Inspector of Mines, and shall provide a written report within 24 hours of the incident.
4. No person shall possess any explosives or detonators except as required in the performance of his or her duties at the time.
5. No person shall remove, or be permitted to remove, explosives or detonators from a worksite without a specific written authorization given by the General Manager, Northern Operations in respect to each occurrence.
6. No explosive or detonator shall be abandoned, but it shall be moved to a suitable storage place or disposed of in accordance with the manufacturer's recommendations or in a recognized and safe manner.
7. Cases or bags of explosives or individual cartridges shall not be dropped, thrown or dragged across another surface.
8. A detonator or an explosive shall not be carried in the pocket of a worker's clothing.

### **Handling of Explosives**

1. The handling and movement of explosives and detonators shall be done under the supervision of a qualified supervisor.
2. Only implements made of non-sparking material shall be used to open boxes containing nitro-glycerine explosives.
3. An explosive shall not be placed near an open flame, naked light, open fire, open heating unit or any other substance or thing likely to cause an explosion or a fire.
4. All employees handling explosives will be required to use personal protective equipment to protect them from accidental contact with blasting agents. This includes, but not limited to eye protection, rubber gloves, long sleeve coveralls and steel toe boots.



5. Any person who discovers explosives he or she believes to be defective shall report them without delay to the supervisor in charge. The supervisor without delay shall report the defective explosives to the General Manager, Northern Operations who will be required to make a report to Mines Inspection Branch as per the Mine Health and Safety Regulations.
6. A deteriorated explosive as evidenced by damage to the cartridge or by exudation therefrom, or by a soft, mushy cartridge which has an oily or greasy appearance shall not be used in any blasting operation.
7. Safety fuse, otherwise known as tape fuse, shall be permitted on any of Miramar sites.
8. The thawing of frozen explosives shall be done in accordance with the manufacturer's recommendations, but in no case shall such thawing be done near an open fire or a steam boiler or by direct contact with steam or hot water.

#### **Electrical Storms**

1. During an electrical storm or if an electrical storm appears imminent, all work around explosives will cease and all employee's will be evacuated to a safe distance.

#### **Transportation of Explosives and Detonators**

The transportation of explosives and detonators shall be performed in strict accordance with the Mine Health and Safety Regulations. (Refer to section 14.29)

#### **Caveat**

These procedures have been written only for the purpose of storage, movement and handling of explosives and detonators. These procedures do not cover preparing of explosives, drilling, loading and priming, firing, boot legs, mis-fire or missed-holes. For more information, please refer to the Mine Health and Safety Act and Regulations.

## **APPENDIX B**

### **MSDS Sheets For Ammonium Nitrate and Fuel Oil**



# 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 applications 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 of 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.



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

**MSDS**

**Material Safety Data Sheet**

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

M

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  
Chemtec: 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

## 1. Product Identification

**Synonyms:** Nitric acid, ammonium salt

**CAS No.:** 6484-52-2

**Molecular Weight:** 80.04

**Chemical Formula:** NH<sub>4</sub>NO<sub>3</sub>

**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

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**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<sup>(tm)</sup>** Ratings (Provided here for your convenience)

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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)

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#### Potential Health Effects

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##### **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.

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## 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.

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## 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.

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## 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.

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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. 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.

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## 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 sulfur.

**Conditions to Avoid:**

Heat, flame, ignition sources, dusting and incompatibles. Moisture and combustible materials. Shock sensitive.

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## 11. Toxicological Information

Oral rat LD50: 2217 mg/kg.

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

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## 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.

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## 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.

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## 14. Transport Information

### Domestic (Land, D.O.T.)

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**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.)

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**Proper Shipping Name:** AMMONIUM NITRATE

**Hazard Class:** 5.1

**UN/NA:** UN1942

**Packing Group:** III

**Information reported for product/size:** 300LB

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## 15. Regulatory Information

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

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

```

```

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

```

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

```

```

313-----
Ingredient                                -SARA 302-  -----SARA
Chemical Catg.                          RQ    TPQ    List
-----
Ammonium Nitrate (6484-52-2)          No    No    No
Nitrate cmpd

```

```

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

```

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TSCA-
Ingredient                                -RCRA-      -
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:**



## **APPENDIX C**

### **Spill Procedures for Ammonium Nitrate – Fuel Mixture**



## AMMONIUM NITRATE FUEL MIXTURE (ANFO)

CONSIDER ACTION ONLY IF SAFETY PERMITS!

ELIMINATE IGNITION SOURCES

If safe stop the source of spill

On land	<ul style="list-style-type: none"> <li>• Block entry into waterways</li> <li>• Do not flush into sewer/drainage system</li> <li>• Contained fuel will float to surface, use absorbent</li> <li>• Contain spill by dyking with earth or other barrier</li> <li>• If liquid, remove minor spills with sorbents, large spills with pumps or vacuum equipment</li> <li>• Prills /granules can be shovelled or removed mechanically</li> </ul>
On snow and ice	<ul style="list-style-type: none"> <li>• Block entry into waterways and contain with snow or other barrier</li> <li>• Remove ammonium nitrate and contaminated snow with shovels or other mechanical means</li> </ul>
On tundra	<ul style="list-style-type: none"> <li>• Do not deploy personnel and equipment on marsh or vegetation</li> <li>• Remove ammonium nitrate and contaminated snow with shovels or other mechanical means if feasible</li> <li>• Burning is not feasible</li> <li>• Flushing with low pressure water can be tried if feasible</li> <li>• Minor spill amounts can be left in place to serve as fertilizer</li> <li>• Minimize damage caused by equipment and excavation</li> </ul>
On water	<ul style="list-style-type: none"> <li>• Ammonium nitrate sinks and mixes with water; contain spill by isolating contaminated water through damming or diversion</li> <li>• Flushing with water can be tried, if spill area cannot be isolated</li> </ul>
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	<ul style="list-style-type: none"> <li>• Segregate waste types</li> <li>• Place contaminated materials into marked containers</li> <li>• Consult with environmental authorities during final disposal</li> </ul>



## **APPENDIX D**

### **NT-NU Spill Report Form and Spill Form Guide**





# NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE

TEL: (867) 920-8130

FAX: (867) 873-6924

EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR		REPORT TIME		<input type="checkbox"/> ORIGINAL SPILL REPORT, OR <input type="checkbox"/> UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER _____
	OCCURRENCE DATE: MONTH – DAY – YEAR		OCCURRENCE TIME			
C	LAND USE PERMIT NUMBER (IF APPLICABLE)			WATER LICENCE NUMBER (IF APPLICABLE)		
	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION				REGION <input type="checkbox"/> NWT <input type="checkbox"/> NUNAVUT <input type="checkbox"/> ADJACENT JURISDICTION OR OCEAN	
E	LATITUDE			LONGITUDE		
	DEGREES	MINUTES	SECONDS	DEGREES	MINUTES	SECONDS
F	RESPONSIBLE PARTY OR VESSEL NAME		RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION			
	ANY CONTRACTOR INVOLVED		CONTRACTOR ADDRESS OR OFFICE LOCATION			
H	PRODUCT SPILLED		QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES		U.N. NUMBER	
	SECOND PRODUCT SPILLED (IF APPLICABLE)		QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES		U.N. NUMBER	
I	SPILL SOURCE		SPILL CAUSE		AREA OF CONTAMINATION IN SQUARE METRES	
	FACTORS AFFECTING SPILL OR RECOVERY		DESCRIBE ANY ASSISTANCE REQUIRED		HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT	
K	ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS					
L	REPORTED TO SPILL LINE BY	POSITION	EMPLOYER	LOCATION CALLING FROM	TELEPHONE	
	ANY ALTERNATE CONTACT	POSITION	EMPLOYER	ALTERNATE CONTACT LOCATION	ALTERNATE TELEPHONE	

## REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION	EMPLOYER	LOCATION CALLED	REPORT LINE NUMBER
		STATION OPERATOR		YELLOWKNIFE, NT	(867) 920-8130
LEAD AGENCY <input type="checkbox"/> EC <input type="checkbox"/> CCG <input type="checkbox"/> GNWT <input type="checkbox"/> GN <input type="checkbox"/> ILA <input type="checkbox"/> INAC <input type="checkbox"/> NEB <input type="checkbox"/> TC			SIGNIFICANCE <input type="checkbox"/> MINOR <input type="checkbox"/> MAJOR <input type="checkbox"/> UNKNOWN		FILE STATUS <input type="checkbox"/> OPEN <input type="checkbox"/> CLOSED
AGENCY		CONTACT NAME	CONTACT TIME	REMARKS	
LEAD AGENCY					
FIRST SUPPORT AGENCY					
SECOND SUPPORT AGENCY					
THIRD SUPPORT AGENCY					





## Instructions for Completing the NT-NU Spill Report Form

This form can be filled out electronically and faxed to the spill line at 867-873-6924. Commencing on January 2, 2007, the form can also be e-mailed as an attachment to [spills@gov.nu.ca](mailto:spills@gov.nu.ca). Until further notice, please verify receipt of e-mail transmissions with a follow-up telephone call. Spills can still be phoned in by calling collect at 867-920-8130.

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