SPILL CONTINGENCY PLAN

LUPIN OPERATIONS

Lupin Mine site
NUNAVUT, CANADA

Submitted under:
WATER LICENCE NWB1LUP0008
NUNAVUT WATER BOARD

Revised November, 2007

Prepared By: _____ Date: _____

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1.0 GENERAL

1.1. PREAMBLE

This Contingency Plan has been compiled with respect to the requirements within Water License NWB1LUP0008, Part H, Item 1; renewed on July 1, 2000, and is effective from January 1, 2008 to December 31, 2008

An annual review of the Plan takes place and revisions are usually submitted as necessary with the annual report.

Mining and milling operations at Lupin were suspended in January 2005 and the property was put on Care and Maintenance.

The "Guidelines For Contingency Planning, Northwest Territories Water Board, 1987", have been utilized as the guide to the requirements of the manual as per Item 1, Part H. The Plan has been expanded beyond these guidelines where appropriate.

1.2. CONTACTS

The Corporate person responsible for the operation of the Lupin site is:

Andrew Mitchell
Zinifex Canada Inc.
Manager, Environmental Affairs
401 1113 Jade Court
Thunder Bay, Ontario
Canada
Phone: (807) 346-1668

Site Managers are:

Dave Stevenson, Project Manager
Randy Oinenon/Casey Lunn, Camp Managers

Phone (416) 987-0357
Zinifex Canada Inc.
Izok Camp - NT

1.3. DISTRIBUTION LIST

Affiliation	Position	Name	Copy #
Zinifex Canada Inc.	Chief Executive Officer	Ewan Downie	
Zinifex Canada Inc.	Chief Operating Officer	John Begeman	
Zinifex Canada Inc.	Chief Financial Officer	Steve Filipovic	
Zinifex Canada Inc.	Manager, Environmental Affairs	Andrew Mitchell	
Zinifex Canada Inc.	Project Manager - Izok Lake	Dave Stevenson	
Zinifex Canada Inc.	Project Manager- High Lake	Jason Rickard	
Zinifex Canada Inc.	Sandra Rickard	Geologist, Land Administrator	

Additional copies of the Plan may be obtained by contacting the Manager, Environmental Affairs, at the address above.

1.4. PURPOSE

This Contingency Plan is designed to provide the necessary background information and plans of action in the event of a failure at the facility or an incident within the Lupin Mine Operations resulting in a spill of fuel, oil, reagents or tailings. It is intended to outline the means for responding to failures and material spills within these systems in a way that will minimize potential health hazards, environmental damage and clean up costs.

The objectives of the Plan are to:

- Define the reporting procedures and communication network to be used in the event of a system failure or material spill.
- Define procedures for the safe and effective containment and clean up/disposal of a system failure or material spill.
- Define specific individuals and their responsibilities.

The transportation joint venture which is responsible for the winter road, drafts a contingency plan for the road before hauling starts entitled "Tibbitt to Contwoyto Winter Road Joint Venture Spill Contingency Plan" for winter road personnel and the transportation of supplies via the winter road. A copy is available on site for reference in the event that the assistance of Lupin personnel is requested for a winter road emergency. The Lupin Operations Contingency Plan is limited to the Lupin Mine Operations and is not intended to cover the response action plans for winter road transportation.

1.5. ZINIFEX CORPORATE ENVIRONMENTAL POLICY

Our aim is to achieve a high standard of care for the natural environment in all of the activities in which we engage. We undertake to minimize our impact on the environment by:

We will:

- conducting our operations in compliance with all relevant environmental regulations, licenses and legislation as a minimum condition
- identifying, monitoring and managing environmental risks arising from our operations
- seeking continuous improvement in environmental performance, production processes, waste management and the use of resources
- providing appropriate training and awareness for all employees on environmental issues
- communicating regularly with employees about our aim and about individual responsibilities
- informing our customers and suppliers of our aim and of their responsibilities in relation to our business

- communicating with shareholders, the community and governments about our environmental performance, and contribute to the development of laws and regulations which may affect our business.

2.0 REPORTING PROCEDURES

2.1. INITIAL REPORTING/ACTION

Upon encountering a failure within any of the disposal systems or a petroleum/ chemical spill, every Zinifex Canada Inc. employee/contractor is responsible for immediately reporting the situation to their supervisor, or if unavailable, report directly to the Manager, Environmental Affairs. A telephone listing of department management is included in Appendix I

An assessment of the spill/potential spill should be made, regarding identification of the material, risk to personnel safety and the environment, cessation, control and containment. If you are ***SURE it is SAFE*** to do so, an attempt should be made to control the spill. Otherwise, after reporting the incident to a supervisor, you should ***REMAIN CLEAR*** and prevent others from accidentally entering the area.

2.2. INTERNAL REPORTING

Once the incident has been reported to the supervisor and an assessment has been made, the spill reporting will be handled as an incident through the accident/incident investigations. Upon proper notification of the personnel in the "Response Team Flow sheet" (Figure 1), remedial action can commence in accordance with the corresponding response plan. The immediate reporting of the spill to the ***24 HOUR SPILL HOTLINE (867) 920-8130*** (fax 867–873–6924) will be carried out by the Manager, Environmental Affairs or the Project Manager or, if neither is available, the appropriate designate.

2.3. EXTERNAL REPORTING

The Manager, Environmental Affairs (or designate), upon receiving a report, will follow through with the "Response Team Flow sheet" (Figure 1) and its first line of authority.

The Response Team shall then:

1. Proceed to the failure/spill location and assess the situation;
2. ***DO NOT TAKE ANY UNNECESSARY RISKS***
3. Make arrangements for first-aid and removal of injured personnel;

4. Co-ordinate equipment support and mobilize to location;
5. When an unauthorized discharge of waste occurs or *where there is a reasonable likelihood* of a spill, *REGARDLESS OF QUANTITY*, fill out as complete as possible, a formal Spill Report Form (Figure 2, Appendix II). Retain the original and deliver one copy of the report to each of:
   - Manager, Environmental Affairs – Andrew Mitchell,
   - Project Manager, Izok Camp – Dave Stevenson
6. Upon reporting a spill to the Spill Report Line, ***the INAC Water Resources Inspector (Iqaluit)*** must be notified at **(867) 975-4289,** if the spill is above the reportable quantities.

The Manager, Environmental Affairs or designate, shall complete a Detailed Spill Report and submit to a Water Resources Inspector no later than 30 days after the initial report of the spill.

Submit to:

Andrew Keim
Water Resources Officer
DIAND, Nunavut District, NT
Baffin Region
P.O. Box 100
Iqaluit, NT
X0A 0H0

Several Government departments are available with expert advice to assist in decision making where there are environmental concerns. A telephone listing of these departments is included in Appendix I.

Where there is a concern for the general health and safety of the public, every effort should be made to contact local communities and hunters and trappers associations. See Appendix I for current contacts and phone numbers.

2.4. RESPONSE TEAM ORGANIZATION

The response team organization has been summarized in the Response Team Flow Sheet (Figure 1). Within this team there are key personnel who will respond to all spills and assist in the implementation and coordination of the respective response plans. The titles and roles of these individuals include, but are not limited to those outlined below. Since the property is in care and maintenance and currently has no personnel on site

the initial response team will be at the Izok Lake exploration camp located approximately 75km west of the Lupin Mine Site.

2.4.1. MANAGER, ENVIRONMENTAL AFFAIRS

The Manager, Environmental Affairs will:

- Ensure that the Plan is properly distributed to those personnel most likely to encounter a spill or unauthorized release.

- Ensure that all personnel are adequately trained in the safe working procedures and have access to the proper personal protection for handling hazardous material spills prior to an incident occurring.

- Ensure that all equipment is properly designed and maintained, and is available for an emergency situation to minimize the risks during response.

- Carry out all media relations. Note that incoming media or other outside inquiries should be directed to the Manager, Environmental Affairs or designate.

2.4.2. PROJECT MANAGER – IZOK LAKE

The project Manager – Izok Lake will:

- Provide technical support to personnel involved with the incident response. Under their direction, personnel are available for collection and preservation of samples.

- Provide all necessary personnel and equipment to contain, mitigate and clean up the spill as required

- Initiate the relocation of any additional supplies that may be required to the incident location.

- Provide availability of maintenance personnel of so required for the termination of a spill or release and repair of faulty equipment.

- Ensure all safety practices are in place and that the activity is performed according to safety standards.

- Provide technical advise on containment, clean up and disposal procedures activated through the Plan.

2.5. RESPONSE TEAM ROLE

Following consultation between the Manger, Environmental Affairs and the Exploration Manager, or their designates, the role of the team(s) upon arrival at a competent failure, petroleum, or chemical spill are as follows:

a) Assemble the necessary personnel and equipment required to contain a spill;
b) Proceed to the scene and coordinate the overall clean up and or repairs.
c) Assess the possibilities of any danger to life, property or equipment;
d) Determine if any product is seeping
e) Take necessary action required to stop/reduce/contain any further product from escaping
f) Attempt to determine the extent of the damage if it extends beyond an original containment area;
g) If contained within a berm (fuel/oil) pump out that which is recoverable, then remove and replace the soil within the berm (contaminated soil to be removed to the disposal site and burned) Any burning requires prior approval from the regulatory authorities
h) If outside of the berm (fuel/oil) attempt to determine whether the cause is from overflow or a damaged berm/liner. Should the cause be a damaged liner, repair it or replace it.
i) Determine whether it would be safe to burn off the spilled fuel or would the surrounding soil have to be removed to a disposal area and burned. Any burning requires prior approval from regulatory authorities

j) If chemical, determine extent of spill, whether any material is still escaping and the containment necessary (ID chemical and reference MSDS, etc.)

k) All contaminated materials are to be removed and deposed of according to the individual response plans, or as directed by appropriate regulatory personnel.

3.0 SITE INFORMATION

3.1. GENERAL

The Lupin Mine is located in Nunavut on the western shore of Contwoyto Lake, approximately 285 km S.E. of the community of Kugluktuk and approximately 400 km northeast of Yellowknife. The coordinates are 65° 46' Latitude and 111° 14' Longitude (see Figure 3).

Mining operations were terminated on January 26, 2005 and mill tailings discharge was terminated in June, 2005. The tailings line between the mill and the tailings containment area was thoroughly flushed out with fresh water and decommissioned at the end of October 2005. The property is now on care & maintenance.

The Lupin site is completely self-contained with the exception of the transportation requirements for materials/supplies and workforce mobilization. There are two main areas; the residential complex consisting of accommodations, kitchen, and recreation centre, and the industrial plant complex comprised of milling and maintenance areas, head frame, hoist room, powerhouse, and warehouse and office facilities.

During the winter months, the Lupin operation is serviced by an ice road from Yellowknife, NWT. With an operating window of approximately 6 weeks, the winter road is used to facilitate the re-supply of Lupin with fuel and bulk supplies for the ensuing year. With the termination of mining and milling operations, there is no further requirement for reagents. All reagents which remained on site following termination of milling have been returned to manufacturers or sold and shipped off site on the 2005 and 2006 winter roads. A modest amount of fuel was trucked to site in the winters of 2005 and 2006. Also, a quantity of explosives remains on site.

Figure 4 shows the general site plan and Figures 6 through 11 show more detailed views of the camp, water supply, sewage and tailings disposal areas.

3.2. SITE COMPONENTS (OPERATIONS)

The site components used to support operations consist of facilities for handling tailings transport, storage, paste backfill, sewage handling, mine water disposal and freshwater supply. These are described below.

3.2.1. MILL TAILINGS HANDLING

Mill production commenced in 1982, with temporary suspensions of operations from January 1998 to April 2000, and from August 2003 to March 2004. Mining activities were terminated as of January 26, 2005, and the mine decommissioned. Mill discharge to tailings ceased in June, 2005. The property is now under **care and maintenance.**

While the mine was in operation, the mill tailings slurry was transported approximately six (6) kilometres to the tailing containment area (TCA), via an eight (8) inch diameter insulated pipeline. The total impoundment area of approximately 750 hectares consists of four solids retention cells (Cells 1, 2, 3 and 5), and three liquid holding ponds. Cell 4 was originally planned as a solids retention cell but has instead been used as a primary polishing pond. It is separated from Cell 3 by an internal dam.

The main liquid holding ponds (Pond 1, Pond 2) are operated in series and are separated by a constructed dam (J-Dam). Lined perimeter dams contain the liquid in Pond 2, which is discharged via siphons, usually bi-annually, in July/August. (Figure 4 shows a typical dam construction).

3.2.2. SEWAGE

All camp sewage is discharged to the two (2) cell Sewage Lakes system for storage, via a six (6) inch insulated pipeline of approximately 500m in length. Annual decant of the system provides adequate storage capacity and treatment for all current camp needs.

A constructed dam divides the system into two cells, which are operated in series. Discharge to the environment via a siphon system from the second lake takes place annually between June and October. See Figure 6 for details.

3.2.3. PASTE BACKFILL

The Paste Backfill system was introduced to the Lupin Operation in the fourth quarter of 1994. After completion of a number of test stopes underground and assessment, the system was fully operational in 1995. Between 1995 and 2005, approximately 1,800,000 tons of mill tailings, constituting 30% of total tailings produced during that period, were deposited in the underground stopes.

In general, the paste was a high-density mixture of water and fine solid particles (tailings) with moisture content typically between 18% and 22%. Cement was added in various quantities (1-5%) for strengthening properties. The material was then pumped through a high pressure pipeline to the active stopes or to inactive mine voids.

Piping to the underground system is located through the main plant complex where practical. A short distance of pipeline was also located outside the plant to permit the backfilling of the surface crown pillar stopes.

With the termination of operations, mill tailings and paste backfill are no longer being produced, and the distribution system is no longer in operation.

3.2.4. MINE WATER

The Lupin mine is located geographically in an area of continuous permafrost resulting in frozen ground to a depth of approximately 490 metres. Due to this feature, there was very little ground water that required handling from the underground workings.

The day-to-day underground operations required a water supply from surface. Recycling of water occurred throughout the mine, however some water was pumped to surface for disposal in the TCA (Figure 6) via the tailings pipeline.

Pumping of mine water to surface ceased during the summer of 2005 and the system has been decommissioned.

3.2.5. WATER SOURCE/SUPPLY

All process and camp water is obtained from Contwoyto Lake, supplied to the site via an eight (8) inch insulated pipeline (Figure 7). A maximum quantity of 1,700,000 m^3/year (4,657 m^3/day) can be withdrawn for all uses, as stipulated by water license NWB1LUP0008. Since October 2005, water usage has been less than 300 m^3/day, and presently, no water usage is occurring at the Lupin Mine Site.

3.2.6. STORAGE FACILITIES (CONSUMABLES)

All consumables, where practical, are transported to the site via winter road and stored for use during the ensuing year. The items of concern in this contingency plan are the petroleum products and explosive products that are stored in large quantity in above ground facilities. These may contribute some risk with regard to the protection of water quality within the mine site area. Most remaining bulk reagents and chemicals, used for

the milling operation, have been transported off site and returned to the manufacturers, disposed of, or sold.

3.2.7. PETROLEUM PRODUCTS

All bulk storage facilities for petroleum products at the mine have been provided with secondary containment in the form of an impermeable liner and berm. There are 2 fuel tank storage areas on site – the main tank farm and the satellite tank farm. The impoundment volume of each facility is sufficient to accommodate 110% of the largest single tank volume that is contained.

The main tank farm containment, shown in Figure 12, measures 230 metres long by 58 metres wide and contains 15 fuel storage tanks with a total storage capacity of 21.6 million litres. Tank capacities and products are listed in Table 1. Oil cubes (1600 litre capacity each) and drums of various other lubricants are also stored within the main tank farm containment. As seen in Figure 12, the main tank farm includes 2 areas for barrel storage, at the north and south ends. Both barrel storage areas are lined and bermed.

The satellite tank farm is located adjacent to the powerhouse. The 35-metre x 25-metre lined and bermed facility contains 10 (ten) 18,000 gallon capacity tanks for the storage of diesel fuel and 2 (two) 5,000gallon tanks for gasoline.

The products that are located at the site include; Diesel, Jet A and Jet B fuels, Gasoline, Ralube 40 CF, and various lubricating oils.

Please refer to Figure 8 for general location of all storage facilities and Table 1for a summary of the products on site, their amounts, storage units and location of the storage facility. Table 1 lists quantities of product on-site as of March 31, 2006, at the end of the winter road re-supply and product backhauls, which reflects the maximum amount in storage for the remainder of the year.

3.2.8. CHEMICAL PRODUCTS

The major chemical products that were used at the mine and mill (in order of amount) consisted of ANFO, cyanide, lime, lead nitrate, flocculent, ferric sulphate, and zinc dust. Where possible, these reagents were ordered in bulk containers to decrease handling, reduce costs and minimize risk associated with spillage. With the cessation of operations, the mill reagents – cyanide, lead nitrate, flocculent, ferric sulphate, and zinc dust – have been shipped off site and returned to the manufacturers.

Numerous other chemicals/reagents were used on a regular basis at Lupin but, due to the small quantities involved, they are not considered within this document under the detailed response plans. The majority of these chemicals have also been shipped off site, to the Swan Hills hazardous waste facility. MSD sheets are available for all products still present on site. (Appendix II)

3.2.9. RECEIVING ENVIRONMENT

The Lupin mine is located in the barren land tundra of Nunavut. Typical surrounding terrain is that of glacial till overburden and a thin organic layer with a generous amount of low-lying vegetation. Bedrock outcrops and areas of frost shattering exist along with boulder fields. Due to the isolated location of the mine and air access only (with the exception of the winter road haul season), the potential impacts to public access areas are minimal.

Environmentally sensitive areas, in addition to the surrounding tundra include the limited extent of the west shore of Contwoyto Lake where the mine is located, the potential for runoff from the site to the lake, drainage from the sewage lakes system which could enter Contwoyto Lake, and the tailings containment area which, in the event of an unplanned release, would discharge to either the west or south drainage basins of Contwoyto Lake. The six-kilometre tailings line route is no longer in use and not subject to contamination from line spillage.

Most of the larger lakes in the Lupin area are regarded as having fish habitat to some extent. Contwoyto Lake is the largest body of water in the area, containing the greatest water and fisheries resource. Possible sources of contamination of this area include general runoff from the site facilities (petroleum storage areas, winter road access). The sewage disposal pipeline is located on the south end of the complex, therefore, any spill would report to the sewage lakes drainage basin. Boot Lake, located N.E. of the site was the original water supply during construction and is known to be a seasonal fisheries habitat. This area has a potential to be affected in the event of a major petroleum spill from the fuel tank farm.

Along the tailings line route several smaller lakes exist with only one larger lake having a known fish habitat. Punkin Lake, located approximately 1.5 km from the site, is situated in a gentle sloping terrain which receives runoff from an approximately 4-5 km^2 area which includes the location of the No.2 Dump station and the tailings line to the north and south (approx. 2km). As the tailings line is no longer in use, there is no further potential for contamination.

There are several small lakes in the immediate vicinity of the TCA that could have been affected by potential spills from the impoundment. These include Norma Lake, Lori Lake, Long Lake and Boomerang Lake, all of which are considered to be fisheries habitat. These areas are adjacent to the following dam locations; dam 6, 5, 4 and 3 respectively. Dam 3 and 6 are now inactive, as contained tailings have been covered with esker material. Dam 5 has never contained tailings, being at a higher elevation than the level of the tailings. Dam 4 is in excess of 40 metres wide, toe to toe, at the closest point between the Cell 4 polishing pond and Long Lake.

4.0 OPERATIONS SYSTEM - COMPONENT MALFUNCTION PREVENTION

Since the mine site is not operating nor is it occupied by any personnel, the following quarterly inspections will take place:

4.1. TAILINGS LINE

- Visual inspection of the tailings line;
- Inspection of the emergency dump station buildings including piping, valves, doors, heaters and lights
- Inspection of vacuum breaker stations
- Inspection of discharge point for ice build up

4.2. SEWAGE LINE

- Visual inspection of the decommissioned pipeline

4.3. FLOAT PLANE DOCK

- Visual inspection of dock area
- Infilling of sink holes or depressions that may develop due to wave action of Contwoyto Lake

4.4. ENGINEERED FACILITIES

- Engineered facilities at the TCA are checked quarterly for general condition and erosion and existence of any seepage
- The divider dam at the sewage facility is checked for water elevation.

Any immediate concerns from the inspections are brought to the attention of the Manager, Environmental Affairs or designate for timely action. Records of the quarterly inspections are retained on file and are available for review upon request of the inspector.

An annual inspection of the TCA is carried out during ice free, open water conditions by a registered geotechnical engineer. As required by the Water License, the annual report is forwarded to the Nunavut Water Board within 60 days of the inspection.

5.0 SYSTEM MALFUNCTION - RESPONSE INFORMATION

The tailings line and main deposition areas were of utmost concern when operating. Due to the present care & maintenance status, this concern has been mitigated.

5.1. TAILINGS LINE

The tailings line is no longer in use for conveying tailings, mine water or fresh water to the tailings area. Mine water is no longer being pumped from the mine.

The tailings line has not been permanently taken out of service. It may be reactivated at some point in the future, if necessary. If this eventuality occurs, a revision to the contingency plan will be submitted for approval.

5.2. TAILINGS IMPOUNDMENT

Originally, all waste was to be contained within the TCA. As mine capacity increased, it became necessary to expand the TCA and discharge effluent. Effluent discharge commenced on 5 September 1985. Effluent was discharged in mid summer, generally beginning on 15 July and continued for periods that extended into early September. The maximum rate of effluent discharge, as per the Nunavut Water Board water licence, has been 60 000 to 70 000 m3/d (AQUAMIN 1996b; EVS 1996). Since the initial discharge in 1985, effluent was discharged into Seep Creek which empties into an unnamed lake (colloquially known as Unnamed Lake). Unnamed Lake drains into Contwoyto Lake at the south end of Inner Sun Bay.

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The tailings management process at Lupin is as follows:

The tailings slurry is pumped from the mill to one of two solids retention cells (Cell 3 or Cell 5), where the solids settle. For the last four years, Cell 5 has been used for winter deposition and Cell 3 for summer deposition (Figure 3-1). Each spring, usually beginning in late June, the build-up of meltwater and tailings water is decanted from Cells 5 and 3 into Cell 4. Cell 4 has not been used for solids deposition, and functions as a primary polishing pond. Water is held in this cell for a one-year period, where cyanide undergoes natural degradation due to exposure to sunlight, air, and agitation by wind action.

The following year, water is released from Cell 4, through a gated culvert, into Pond #1, where it is held for a further one-year period, before being siphoned into Pond #2. If necessary, the water can be treated with ferric-sulphate during the siphoning process to precipitate arsenic in Pond #2.

Historically, water was retained only for a 2-year period and arsenic levels were still high in Pond #1. An arsenic treatment plant was built between Ponds #1 and #2, so that the water could be injected with ferric sulphate solution as it was being siphoned between the two ponds. Since 2000, water has been retained for a 3 year period (1 year in Cell 4, 1 year in Pond #1, and 1 year in Pond #2). The extra year of water retention before going into Pond #2 has resulted in naturally lowering the arsenic levels, thus negating the use the plant. Periodically, treatments of ferric sulphate (two tonne batches) are placed into Pond #1 to control arsenic concentrations.

Depending on the water level and water quality in Pond #2, water can be released to the environment after 15 July of any year (as per Nunavut Water Board water licence). Water quality is monitored on a daily basis during discharge to ensure that discharge criteria are not exceeded

5.3. SEWAGE SYSTEM

The sewage system is contained by two (2) low dams and natural relief. The system operates as a “closed system” from October to June (i.e. no discharge of effluent from the lakes). Camp discharge enters the upper lake.

Any seepage from the upper lake would report to the lower lake and be addressed to prevent any structural damage to the dam itself. Seepage from the lower lake would be

contained by construction of a catchment basin and, if water quality did not meet license limits, the solution would be pumped back into the lower lake.

If a failure should result along the heat traced six (6) inch pipeline between the camp and the upper lake, an alternate disposal location would be initiated.

A short-term option, available with minor modifications to the system, is to re-route the sewage line within the mill complex to connect up with the old mine water discharge line and pump to the second (lower) sewage lake.

Appropriate response team action would have repairs completed to the satisfaction of management and the system returned to the upper lake within a reasonable time frame.

5.4. MINE WATER

Due to termination of mine operations, mine dewatering activities have ceased. The mine pumps have been shut down and the mine is being allowed to flood. There is no further possibility of a spill. Mining operations and dewatering may be resumed at some point in the future.

6.0 PETROLEUM AND CHEMICAL PRODUCTS - RESPONSE INFORMATION

6.1. GENERAL

The petroleum and chemical products used at the Lupin Mine that exist in significant quantities and which are of concern within this Plan are summarized in Table 1, located in Appendix III Table 1 indicates the petroleum/chemical product name, storage location and normal storage container packaging or storage volume utilized. In addition to the product quantities referred to as stock-on-hand, the quantities of product expected to be on-hand after winter road re-supply and product backhauls are also listed. This list would then indicate the maximum quantity of a product to be on site at any one time. Because of the suspension of mining and milling operations, most reagents were returned to the manufacturers on the 2005 and 2006 winter roads.

There are two standard operational procedures where possible spill scenarios may be encountered. These apply during:

1) receiving/offloading procedures during winter road re-supply whereby fuel is pumped from tanker trucks to site storage facilities, and shipping/loading of surplus inventories of chemical supplies onto transport trucks; and
2) normal daily operations whereby fuel is pumped from the main tank farm to the vehicle refueling/powerhouse satellite tanks and mill reagents are transported from the cold storage facilities for shipment.

During the winter road re-supply period there may be times when Lupin Mine personnel will be called upon to assist in a winter road spill recovery. Internal policies will ensure that the Site Supervisor and lead hands are familiar with procedures followed by the Winter Road Transportation and Operations contractor and are available to provide assistance where necessary, generally for the upper portion of the winter road on Contwoyto Lake. Material and supplies for these types of spill recovery plans (i.e.: overturned tanker) are available, in the "Emergency Spill Response" sea container for easy transport on the road.

The measures outlined in the response plans intend to minimize the potential impact to water and land following a petroleum/chemical spill. Keeping in mind that the

immediate action is to preserve health and limit environmental damage, the plans deal with the procedures/methods of spill containment, termination, remedial measures and clean-up of spills related to those products used at the mine.

6.2. SPILL CONTAINMENT, RECOVERY AND DISPOSAL

The potential exists for spills of petroleum products and various chemicals used at the Lupin Mine. A spill may be in the form of a liquid as in petroleum products, or in the form of a solid as in the ANFO or a chemical reagent used on a regular basis. A liquid chemical spill is likely to occur only in the mill reagent mix area where control measures are in place to reduce the risk of a spill migrating outside of the building. A liquid chemical spill could also result if a dry chemical contacts water once the spill has taken place.

The spill of either form may occur in one or a combination of the following areas; on land, snow, ice or in the water. Various proven practical methods of containment and recovery are well documented for use in northern climates and are summarized below. For additional technical information, one should consult the Environment Canada Report EPS 9/SP/2, December 1986.

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

6.2.1. CONTAINMENT ON LAND

The potential for spills to occur on land is the highest of the four areas due to the transferring of materials via the winter road, as well as movement year-round from storage locations to areas of use. During the winter road re-supply, the greatest amount of material is moved in a short period of time and therefore the snow and ice factor also plays an important role.

Petroleum products spilling onto frozen snow covered ground may be contained by the construction of snow dykes. For fast initial containment of smaller spills, the dykes can be built manually with shovels. Larger spills may require the use of heavy equipment such as graders and bulldozers.

The impermeability of dykes may be ensured by lining with a polyethylene liner, plastic tarpaulin or similar synthetic material. Alternatively, in freezing temperatures, water may be sprayed or poured over the dykes to further enhance the barrier to the spilled material. This method assumes that water is available or may be accessed from the spill site. Synthetically lined dykes are more effective than just snow or snow and ice-lined dykes.

During warmer months, containment dykes may be constructed from **sand or gravel** if these materials are available in an unfrozen form. Again, for smaller spills, the dykes can be fashioned manually with shovels where for larger spills, trucks or other heavy equipment (front-end loaders) will normally be required to transport and handle sand and gravel.

Trenching or ditching can be used as a method for containing and/or intercepting the flow of liquid spills on land. Ice, snow, loose sand, gravel and surface layers of organic material can usually be scraped or dug away until the underlying frozen substrate is reached. This can be effective in re-directing flow or simple containment prior to pumping or absorbing the spilled material. Trenching in solid frozen ground or rocky substrate is normally neither practical nor possible.

The spillage of solid materials on land is much simpler to contain and recover. During the winter months, spilled material is generally self-contained due to its nature. Some precaution with regard to wind-blown dispersion may be required with lighter materials (lime). In these cases, a **layer of snow** placed on top of the spilled material will suffice until removal to appropriate disposal is arranged. In summer months, minor **containment berms** will be required when there is moisture present or precipitation is occurring or is likely to occur.

6.2.2. CONTAINMENT ON SNOW

Containment on snow is readily achieved and is very effective due to its absorbent quality. Liquid spills (petroleum) will become immobile within the snow pack and easily removed for transport for recovery or disposal. Use the snow to its advantage in construction of snow dykes/dams. Whenever possible, the snow pack should be left in place to avoid contaminating the underlying substrate.

6.2.3. CONTAINMENT ON ICE

Spills that occur on ice, from either direct spillage or migration to the ice, are greatly affected by the strength of the ice. If the spill does not penetrate the ice, and the ice is safe to work on, then the methods of containment are similar to that on land. Where the

spill has penetrated the ice, the situation should be handled similar to that on open water. If, as in petroleum spills, the material floats, then every effort should focus on the recovery of the material using pumping/suction methods, and absorbents.

6.2.4. CONTAINMENT ON OPEN WATER

A spill occurring on or into open water is very difficult to contain and every effort should be made to prevent the material from entering the water. If in the case of petroleum products, the material floats, then immediate deployment of surface booms should take place to control the spread of material. Pumping is the method of choice for removal of contained material.

6.3. RECOVERY

Spilled petroleum products contained within a dyked or trenched area should be recovered by pumping into a standby tanker, portable storage tank or drums dependent on volume involved, or use of an independent vacuum truck. Pump and suction hoses should be screened to prevent snow, ice or debris from clogging the line or pump.

Any remaining material may be absorbed by use of a variety of natural and commercially available products, such as 3M brand Conweb and Phase III brand Oil Sponge.

The availability of shovels, rakes and pitchforks are invaluable in any spill clean-up and recovery operation. The use of heavy equipment for larger spill situations such as front-end loaders and haul trucks, make the removal of material easier. It also ensures that all materials, including absorbent sand, snow etc. have been removed from the site.

6.4. DISPOSAL

Petroleum products such as oil that has been recovered by pumping into portable tanks, drums or a standby tanker can often be reclaimed and reused. Water and debris can be separated from the pure fuel by gravimetric means in a tank. In this manner disposal can be minimized and financial losses reduced.

In-situ combustion may be used as a final means of disposal after every effort has been made to remove the spilled fuel/oil etc. Approval for burning of petroleum products must be obtained prior to combustion. Burning should never be carried out on land where combustible organics are present and the oil has migrated into the soil. Removal is the method of choice in this case.

The most efficient means of igniting diesel oil for in-situ combustion is with a large size portable propane torch. Other highly flammable products such as gasoline or alcohol, or combustible products, such as wood may also be used to promote ignition of the spilled product. Spilled oil should be ignited where it has pooled naturally or been contained by dykes, trenches or depressions. Oil which has collected in slots in river ice may also be disposed of by in-situ combustion if sufficient holes are drilled in the ice (but not through to the water). Once holes are drilled, the oil which collects in the holes may be ignited.

Liquid oil wastes (which cannot be reclaimed), oil contaminated snow and debris and oil residues left after in-situ combustion will be picked up and disposed of at a land disposal site approved by government authorities. Currently, hydrocarbon contaminated materials are removed to either the incinerator or the burn area of the site landfill for ignition. Disposal at local municipal dumps may be an alternative if required. In this case GNWT would be consulted.

In their technical review of the 2000 Contingency Plan, Environment Canada commented that bioremediation should be considered as an option for the treatment of contaminated soils. They suggested that a lined pit could be constructed at the landfill and ammonium nitrate already at site could be used as the fertilizer, and the heavy equipment used for mixing and aerating. The problem with this suggestion at the time was that the ammonium nitrate on site was purchased pre-mixed with fuel oil, thereby making the explosive ANFO (ammonium nitrate fuel oil), which is the main blasting agent that was used at the mine. The previous Lupin operation did not manufacture this explosive on site, as some other mines do, and so did not have a ready supply of the fertilizer needed for bioremediation. A product which Lupin identified as having had success with was the Phase III brand “Oil Sponge”. This is a bio-remedial absorbent composed of cotton linters, pecan pith, nutrients and microbial cultures.

Spilled chemical products will be recovered and reused wherever possible. Materials unable to be used will be collected and stored in containers and shipped off site for disposal.

6.5. OTHER CONCERNS

6.5.1. FIRE

In the event that the accident/incident is in combination with a fire, extinguishing the fire may be required prior to initiating efforts to stop the spillage.

In order to control the resulting runoff (in cases where water is used), and the subsequent spreading of the spilled material, any indication of slope away from the area of the spill should be dyked for containment.

Petroleum and chemical fires have the potential to generate toxic fumes under poor combustion conditions. Approaching and dealing with any fire from upwind is recommended as well as caution with regard to breathing the vapours generated from the fire.

In the case where Anfo is the material involved, the following action should be taken;

1. rope off the area and control entry;
2. evacuate the area and do not attempt to fight the fire;
3. the ANFO, or any resulting solution (fire in winter on snow or ice) must not be allowed access to bodies of water, especially flowing streams/rivers; and
4. fires involving small quantities of ANFO may be fought using water, however if the fire is not a hazard to persons or the surrounding environment, it is generally accepted to allow the material to burn off, then initiate clean-up measures.

6.5.2. MAIN FUEL TANK FARM

In the event of any emergency at the tank farms relating to fire, flooding, spills, etc; all electrical power shall be shut off as quickly as possible within the tank farm area to minimize further damage. The procedure can be initiated through the powerhouse and electrical departments.

7.0 SPILL RESPONSE RESOURCES

A wide variety of spill control/recovery equipment and materials exists at the site for dealing with emergency spills of petroleum products and chemical reagents. Heavy construction equipment is also available for use on demand.

7.1. RESPONSE EQUIPMENT

All equipment is stored in such a manner as to be readily available on short notice. Surface crews would immediately respond to a reported spill site by moving equipment and material necessary to provide control and clean-up measures at the reported spill. Additional operations personnel are available if the need arose.

The equipment to be used would consist of a Volvo 20t haul truck, two Komatsu WA250 loaders, CAT 14H grader, CAT 966G loader, Komatsu D85 dozer, 5 light vehicles and a rubber tired backhoe. A current list of Zinifex Canada Inc. equipment at the Lupin Mine is available in Table 2. This list will be updated and forwarded to the NWB as required. Contractor-owned heavy mobile equipment (loaders, dozers) may also available during operational summer months, but not available during winter months.

Emergency spill containment and recovery materials and supplies are available for immediate mobilization at any time. Table 3 lists the materials inventory for the "Emergency Spill Response" van, available to be located at a spill site. The on-site warehouse maintains a supply of absorbent pads, floor dry absorbent, oil sponge, hoses, couplings and miscellaneous parts for recovery equipment. The van container, centrally located near the fuel receiving area of the tank farm, is indicated on Figure 8, Storage Facilities.

7.2. RESPONSE TEAM

Authorization for deployment of personnel, containment, clean-up and recovery equipment are as per the Figure1 “Response Team Flow sheet” organizational chart.

The designate/next in line authority shall be contacted if management is unavailable.

A current telephone listing of Zinifex Canada Inc. is included in Appendix I.

7.3. TRAINING AND EXERCISES

All response team staff will maintain familiarity with the continually updated Contingency Plan by scheduling periodic reviews. For the designated personnel this is completed in conjunction with the review of the sites Emergency Procedures Manual.

All personnel dealing with equipment that would be involved in cleaning up any spills related to Contingency Plan already have extensive experience as heavy equipment operators and therefore further training in this area is not seen as applicable.

Training with regard to hazardous materials handling is carried out in conjunction with annual Transportation of Dangerous Goods Regulation (TDGR) training for all employees handling hazardous materials defined by the TDGR.

Workplace Hazardous Material Information System training is provided to all new employees as well as in the form of annual refresher courses for current employees. Core WHMIS along with job specific training is covered in these programs. Information, through WHMIS, is available at each department for “specifics” of that department. As well, master stations are in place which carry the MSDS’s for the entire site.

The question of a simulation exercise should be scrutinized because it is our belief that during a simulated exercise, there could be damage caused to the fragile tundra which may result in extensive long term effects.

8.0 COMPONENT AND PETROLEUM/CHEMICAL PRODUCT DETAILED RESPONSE PLANS

The following section contains the Response Plans for the major System Components of the mine site and Petroleum/Chemical products stored and used at the Lupin Operation.

8.1. SYSTEM COMPONENTS

The Mill Tailings Line, Paste Backfill System, and Mine Water discharge lines are no longer in service. As such, response plans to deal with these systems have been omitted from the Plan. If they are put back in service at some future point, a revision to the Plan will be submitted. The following system components remain in place:

1. Mill Tailings Containment (Retaining Dams)
2. Sewage Disposal Facility

8.2. PETROLEUM/CHEMICAL PRODUCTS

As stated previously, the reagents formerly used in the milling process have been shipped off site. The following lists the products that still remain on site:

1. Diesel Fuel
2. Gasoline and Aviation Fuel
3. Lubricating and Hydraulic Oils
4. Ethylene Glycol Antifreeze
5. Hydrated Lime
6. ANFO Explosives

Detailed contingency response plans for each of the fore mentioned components and/or products remaining on site are as follows.

In the event of a **TAILINGS CONTAINMENT ENGINEERING FAILURE (DAMS)** the following action plan is to be initiated.

24 HOUR SPILL REPORT LINE (867) 920-8130

INITIAL SPILL RESPONSE

- Notify Manager, Environmental Manager (or designate) immediately via radio, phone or in person;
- The response team action shall be initiated. **Spill reported via 24 hour emergency spill line**, above;
- Any of the tailings containment area "Cells" can be dewatered to Pond No.1 in the event flow cannot be controlled at the failure site.
- If the tailings solution approaches a flowing natural stream, mobilize team to contain tailings solution from entering stream. Contact should be made with DIAND Water Resources and Environment Canada, Department of Fisheries and Oceans for further direction.
- A detailed spill report shall be submitted as per Section 2.3

HAZARDS

- The mill tailings contained chemicals used in the process and must be handled with these taken into account. The material would have been diluted with raw water during the care & maintenance period and should not be a hazard. Samples will be taken to check this assumption.

ACTION FOR FIRE

- Non-flammable
- Use dry chemical, foam or water spray (fog), although water may spread the contaminant;

RECOVERY

- **Ground contamination**; any tailings solids that have escaped from the containment areas onto surrounding tundra shall be removed and disposed of at the tailings containment area;
- Solutions, where contained shall be pumped back into the tailings containment area;

- If required, esker material and/or crushed wasted rock shall be used to fill any depressions left after excavation of the spill material.

- **Water contamination**; these areas are difficult to mitigate as movement of contaminated material (and water) may continue long after initial incident;
- Local authorities should be contacted regarding advice for cleanup or additional work to be carried out.

DISPOSAL

- Contaminated materials are to be disposed of at the Tailings Containment in the un-reclaimed tailings cell or solutions pumped directly to Pond No.1.

PROPERTIES

- The mill tailings contained a mixture of mill reagents and finely ground rock which has had the precious metal content removed. Reagents used included sodium cyanide, lime, lead nitrate, zinc metal and flocculent;
- Appearance is of dark grey solids suspended in a clear water base solution;

ENVIRONMENTAL CONCERNS

- Solution might be mildly harmful to fish, other aquatic organisms and wildlife;
- Might be mildly harmful to waterfowl;
- Solids portion known to generate acid through oxidation processes if left exposed to weathering and open environment.

CONTAINERS

- N/A

SUPPLIER

- N/A

NOTE TAILINGS CELLS ARE CURRENTLY BEING RECLAIMED. DEPOSITION OF TAILINGS IN THE CELLS IS NO LONGER TAKING PLACE.

In the event of a **SEWAGE SYSTEM FAILURE (PIPELINE/DAMS)** the following action plan is to be initiated.

24 HOUR SPILL REPORT LINE (867) 920-8130

INITIAL SPILL RESPONSE

- Notify Manager, Environmental Affairs (or designate) immediately via radio, phone or in person;
- If necessary, direct the initiation of shut down procedures for the pumping system in order to **STOP** the flow of sewage through to the sewage lakes containment area;
- The response team action initiated. **Spill reported via 24 hour emergency spill line**, above;
- If the failure is piping related, the sewage discharge will be redirected within the mill to connect up with the old mine water line to discharge to the second sewage lake. This option will be temporary until repairs are complete.
- Seepage from the second sewage lake will be contained within a constructed catchment basin, checked for water quality and pumped back to the containment if water quality is not consistent with License requirements. Seepage from the first sewage lake to the second lake will be monitored for water quality during repair activities.
- A detailed spill report shall be submitted as per Section 2.3

HAZARDS

- the sewage stream from the site contains grey water from all sources (mill and mine drys, all accommodation & shower facilities, kitchen and all washroom facilities on site.
- there are no chemicals used in the process;
- due to the nature of the source, health risks are associated with bacterial infections and disease that may be transmitted through exposure.

ACTION FOR FIRE

- Non-flammable
- use CO_2, dry chemical, foam or water spray (fog), although water may spread the contaminant;
- use water to cool other flammable materials;

RECOVERY

- **Ground contamination**; any sewage material that has escaped from the pipeline or containment areas onto surrounding tundra shall be removed, where possible and disposed of within the sewage lake or buried with esker if necessary;
- If required, esker material and/or crushed wasted rock shall be used to fill any depressions left after excavation of the spill material.
- Solutions, where contained shall be pumped back into the sewage lakes containment;
- **Water contamination**; these areas are difficult to mitigate as movement of contaminated material (and water) may continue long after the initial incident;
- Local authorities should be contacted regarding advice for cleanup or additional work to be carried out. INAC Water Resources or Env. Can. Dept. of Fisheries and Oceans.

DISPOSAL

- Contaminated materials are to be stored until disposal within the repaired sewage lakes containment system is possible.

PROPERTIES

- The mine site sewage system contains a mixture of camp waters (excluding those of the mill process and the mine dewatering). These include camp drys, accommodation washroom facilities and kitchen.
- Water accounts for greater than 90% of the component which is used during day to day activities; the remainder is organic solids which readily settle in the disposal system.

ENVIRONMENTAL CONCERNS

- Solution only mildly toxic to fish and other aquatic organisms due to the low dissolved oxygen that may occur at certain times of the year;
- Effluents could contain minor amounts of nutrients (nitrogen components) that may promote plant growth in downstream water bodies.

CONTAINERS

- N/A

SUPPLIER

- N/A

CONTINGENCY PLAN	SECTION: ACTION PLANS
LUPIN MINE	SUBJECT: DIESEL FUEL

In the event of a **DIESEL FUEL** spill or where there is reasonable likelihood of a spill occurring, the following action plan is to be initiated.

24 HOUR SPILL REPORT LINE (867) 920-8130

INITIAL SPILL RESPONSE

- The Manager, Environmental Affairs or designate shall be informed of the incident and the response team action initiated. **Spill reported via 24 hour emergency spill line**, above;
- **STOP** the flow of diesel fuel if possible;
- ELIMINATE open flame ignition sources;
- CONTAIN flow of oil by dyking, barricading or blocking flow by any means available. Use earth-moving equipment if nearby;
- If flow has reached flowing natural stream, mobilize team to deploy river boom, skimmer and absorbent booms.
- A detailed spill report shall be submitted as per Section 2.3

HAZARDS

- Slightly toxic by ingestion, highly toxic if aspirated, drying of skin on contact;
- Flammable, treat as combustible.

ACTION FOR FIRE

- Use CO_2, dry chemical, foam or water spray (fog), although water may spread the fire;
- Use fog streams to protect rescue team and trapped people;
- Use water to cool surface of tanks;
- Divert the diesel fuel to an open area and let it burn off under control;
- If the fire is put out before all diesel fuel is consumed, beware of re-ignition;
- Where diesel fuel is running downhill, try to contain it as quickly as possible;
- Rubber tires are almost impossible to extinguish after involvement with a fire. Have vehicles with burning tires removed from the danger area.

RECOVERY

- Recovered soils from contaminated fuel can be soaked up by sand and peat moss or snow if available, by natural products such as Phase III Oil Sponge, or by synthetic absorbents such as 3M Brand, Graboil or Conwed;
- If necessary, contaminated soil should be excavated;
- Diesel fuel entering the ground can be recovered by digging sumps or trenches;
- Diesel fuel on a water surface should be recovered by skimmers and absorbent booms (See Section on Recovery of Oil Spills).

DISPOSAL

- Incineration under controlled conditions; obtain prior approval.
- Landfarm and bio-remediate at an approved site.

PROPERTIES

- Chemical composition: mixture of hydrocarbons in the range C_9 to C_{18};
- Clear to yellow, bright oily liquid with hydrocarbon odour;
- Not soluble, floats on water.

ENVIRONMENTAL CONCERNS

- Moderately toxic to fish and other aquatic organisms;
- Harmful to waterfowl;
- May create unsightly film on water.

CONTAINERS

- Transported by tanker truck and transferred to various storage tanks in the tank farm. See inventory in Appendix I.

SUPPLIER

- As per annual tendering. (eg: Petro-Canada)
- SEE ATTACHED MSDS FOR ADDITIONAL INFORMATION

CONTINGENCY PLAN	SECTION: ACTION PLANS
LUPIN MINE	SUBJECT: GASOLINE/ AVIATION FUEL

In the event of a **GASOLINE OR AVIATION FUEL** spill or where there is reasonable likelihood of a spill occurring, the following action plan is to be initiated.

24 HOUR SPILL REPORT LINE (867) 920-8130

INITIAL SPILL RESPONSE

- The Manager, Environmental Affairs or designate shall be informed of the incident and the response team action initiated. **Spill reported via 24 hour emergency spill line**, above;
- **STOP** the flow of gasoline or aviation fuel if possible;
- ELIMINATE all possible sources of IGNITION, eg. extinguish cigarettes, shut off motors (from a remote location if surrounded by vapours);
- EVACUATE personnel from danger area;
- CAREFULLY CONSIDER the hazards and merits of trying to contain the spill. Contain only if safe to do so, and obvious benefit of containment is apparent (ie. contain if flowing towards a creek or water body). Otherwise leave gasoline to spread and evaporate. Do not attempt to contain a gasoline spill on water. Allow it to spread and evaporate;
- if spilled in an enclosed area, VENTILATE vapours.
- A detailed spill report shall be submitted as per Section 2.3

HAZARDS

- **EXTREME FIRE HAZARD** (Jet A, MODERATE), highly flammable;
- forms explosive mixture with air; is heavier than air and can migrate considerable distances to sources of ignition and flashback;
- easily ignited by flame or spark;
- avoid contact with oxidizing materials (eg. Lead Nitrate, acids);
- moderately toxic by ingestion, highly toxic if aspirated.
- Note: Jet B contains a small amount of Benzene which is a suspect human carcinogen.

ACTION FOR FIRE

- use CO_2, dry chemical, foam or water spray (fog), although water may spread the fire;

- use jet streams to wash away burning gasoline;
- use fog streams to protect rescue team and trapped people;
- use water to cool surface of tanks;
- divert the gasoline to an open area and let it burn off under control;
- if the fire is put out before all gasoline is consumed, beware of re-ignition;
- where gasoline is running downhill, try to contain it at the bottom prior to reaching lakes or streams;
- rubber tires are almost impossible to extinguish after involvement with a fire. Have vehicles with burning tires removed from the danger area.

RECOVERY

- unburned gasoline can be soaked up by sand and peat moss and snow when available, or by synthetic absorbents such as 3M Brand, Graboil or Conwed;
- if necessary, contaminated soil should be excavated;
- gasoline entering the ground can be recovered by digging sumps or trenches.

DISPOSAL

- evaporation;
- incineration under controlled conditions; obtain prior approval.
- landfarm and bio-remediate at an approved site.

PROPERTIES

- chemical composition: mixture of hydrocarbons; Gasoline C_4-C_{12}, Jet B C_6-C_{14} and Jet A C_9-C_{16}
- light green, clear, amber coloured liquids;
- volatile;
- not soluble, floats on water

ENVIRONMENTAL CONCERNS

- moderately toxic to fish and other aquatic organisms;
- may create unsightly film on water.

CONTAINERS

- Gasoline is transported by tanker trucks and pumped into a storage tank in the satellite tank farm. Bulk shipping via tanker truck of Aviation fuel (Jet A) occurs with tank storage at the main tank farm. Drum shipping and storage is in limited quantities.

SUPPLIERS

- As per annual tendering. (eg. Petro-Canada)
- SEE ATTACHED MSDS FOR ADDITIONAL INFORMATION

CONTINGENCY MANUAL	SECTION: ACTION PLANS
LUPIN OPERATION	SUBJECT: LUBRICATING/ HYDRAULIC OILS

In the event of a **LUBRICATING OIL OR HYDRAULIC OIL** spill or where there is reasonable likelihood of a spill occurring, the following action plan is to be initiated.

24 HOUR SPILL REPORT LINE (867) 920-8130

INITIAL SPILL RESPONSE

- The Manager, Environmental Affairs or designate shall be informed of the incident and the response team action initiated. **Spill reported via 24 hour emergency spill line**, above;
- **STOP** the flow of oil if possible;
- ELIMINATE open flame ignition sources;
- CONTAIN flow of oil by dyking, barricading or blocking flow by any means available. Use earth-moving equipment if nearby;
- A detailed spill report shall be submitted as per Section 2.3

HAZARDS

- low toxicity by ingestion, mildly irritating to eyes
- combustible, low fire hazard;
- avoid contact with oxidizing materials (eg. Lead Nitrate, acids).

ACTION FOR FIRE

- use CO_2, dry chemical, foam or water spray (fog), although water may spread the fire;
- use fog streams to protect rescue team and trapped people;
- use water to cool surface fire exposed containers;
- divert the oil to an open area and let it burn off under control;
- if the fire is put out before all oil is consumed, beware of re-ignition;
- rubber tires are almost impossible to extinguish after involvement with a fire. Have vehicles with burning tires removed from the danger area.

RECOVERY

- after containment, recover as much oil as possible by pumping into drums;
- residual oil may be burned in-situ, upon approval;
- remaining unburned oil can be soaked up by sand, peat moss and snow when available, or by synthetic absorbents such as 3M Brand, Graboil or Conwed;
- if necessary, contaminated soil should be excavated;
- oil on a water surface should be recovered by skimmers and absorbent booms.

DISPOSAL

- incineration under controlled conditions, prior approval required;
- burial at an approved site.
- ship to licensed waste reclaiming facility

CONTINGENCY PLAN LUPIN MINE	SECTION: ACTION PLANS
	SUBJECT: LUBRICATING/ HYDRAULIC OILS

PROPERTIES

- chemical composition: mixture of hydrocarbons and conventional industrial oil additives; C_{20}-C_{66}
- generally viscous liquids, light to dark amber colours;
- not soluble, floats on water.

ENVIRONMENTAL CONCERNS

- moderately toxic to fish and other aquatic organisms;
- harmful to waterfowl;
- may create unsightly film on water and shorelines.

CONTAINERS

- transported and stored in steel drums or cubes (these are self-contained units with an 8 drum capacity).

SUPPLIER

- As per annual tendering.
- SEE ATTACHED MSDS FOR ADDITIONAL INFORMATION

In the event of an **ANTIFREEZE (GLYCOL)** spill or where there is reasonable likelihood of a spill occurring, the following action plan is to be initiated.

24 HOUR SPILL REPORT LINE (867) 920-8130

INITIAL SPILL RESPONSE

- The Manager, Environmental Affairs or designate shall be informed of the incident and the response team action initiated. **Spill reported via 24 hour emergency spill line**, above;
- **STOP** the flow of Antifreeze at source if possible;
- ELIMINATE open flame ignition sources;
- CONTAIN flow of liquid by dyking, barricading or blocking flow by any means available;
- **PREVENT** antifreeze from entering any flowing streams.
- A detailed spill report shall be submitted as per Section 2.3

HAZARDS

- inhalation of mist may cause irritation of nose, throat and headache;
- moderately toxic by ingestion, can be fatal;
- avoid contact with strong oxidizing agents
- flammable, decomposition products include carbon dioxide and/or carbon monoxide.

ACTION FOR FIRE

- use alcohol type or all purpose foam for large fires; CO_2, dry chemical or water spray (fog) for small fires. Do not force solid streams into the burning liquid.

RECOVERY

- ethylene glycol antifreeze can be soaked up by peat moss or snow when available, or by synthetic absorbents such as Hazorb;
- small spills may be washed with copious amounts of water for dilution;

- access to spilled or recovered ethylene glycol by mammals should be prevented.

DISPOSAL

- only incinerate in a furnace under controlled conditions where approved by appropriate federal, provincial and local regulations;
- burial at an approved site.

PROPERTIES

- chemical composition: 96% ethylene glycol (CH_2OHCH_2OH)
- 4% water and rust inhibitors
- clear, syrupy liquid normally contains a dye for identification in water sources;
- 100% soluble in water;
- flammable.

CONTINGENCY PLAN	SECTION: ACTION PLANS
LUPIN MINE	SUBJECT: ETHYLENE GLYCOL - ANTIFREEZE 2 of 2

ENVIRONMENTAL THREAT

- low to moderate toxicity for fish and other aquatic organisms;
- attractive smell and taste to some mammals, and toxic by ingestion.

CONTAINERS

- transported and stored in steel drums or cubes (which are a self-contained unit with an 8 drum capacity).

SUPPLIER

- DOW Chemical of Canada Ltd., Van Waters & Rogers Ltd.
- SEE ATTACHED MSDS FOR ADDITIONAL INFORMATION (Appendix IV)

CONTINGENCY PLAN	SECTION: ACTION PLANS
LUPIN MINE	SUBJECT: LIME - $Ca(OH)_2$, CaO

In the event of a Lime spill (of solid or solution) or where there is reasonable likelihood of a spill occurring, the following action plan is to be initiated.

24 HOUR SPILL REPORT LINE (867) 920-8130

INITIAL SPILL RESPONSE

- The Manager, Environmental Affairs or designate shall be informed of the incident and the response team action initiated. Spill reported via 24 hour emergency spill line, above;
- STOP spill of lime/lime slurry at source if possible;
- PREVENT hydrated lime from contacting water;
- use proper PPE for respiratory protection and body (coveralls, face shield, rubber gloves) when dust is anticipated as a hazard;
- if lime does contact water, Contain solution to as small an area as possible.
- A detailed spill report shall be submitted as per Section 2.3

HAZARDS

- dry chemical prone to dusting
- skin irritant and mild burns - alkaline; dusts and mists may cause irritation of eyes, mouth, nose throat and possibly lungs;
- unslaked lime (CaO) reacts with water to form hydrated lime, releasing heat.

ACTION FOR FIRE

- no special precautions;
- use extinguishing media appropriate for surrounding fires.

RECOVERY

- spills of hydrated lime on dry surfaces can simply be shoveled into containers and re-used if appropriate;
- spills of lime on wet surfaces or exposed to rain should be shoveled into waterproof containers as soon as possible to minimize the quantity of lime being dissolved;

- pump liquids into containers and use sorbets to contain and recover spilled solutions.

DISPOSAL

- Hydrated lime and all lime solutions should be disposed of in Cell 4 or Pond 1.

PROPERTIES

- chemical formula $Ca(OH)_2$;
- unslaked lime (pebble lime, CaO) also used which is not hydrated, therefore reacts with water to form slaked lime
- white or white/grey solid, crystalline powder, odorless;
- strong alkaline;
- slightly soluble in water, less than 1%.

ENVIRONMENTAL CONCERNS

- toxic to fish and other aquatic life at higher concentrations in the order of 50 mg/l and greater.

CONTAINERS

- transported and stored in lined paper bags (25kg) which are palletized and double stretch wrapped (54 bags/pallet);

SUPPLIER

- Continental Lime
- SEE ATTACHED MSDS FOR ADDITIONAL INFORMATION

CONTINGENCY PLAN	SECTION: ACTION PLANS
LUPIN MINE	SUBJECT: AMMONIUM NITRATE/FUEL OIL; ANFO

In the event of an **AMMONIUM NITRATE/FUEL OIL** (ANFO) spill or where there is reasonable likelihood of a spill occurring, the following action plan is to be initiated.

24 HOUR SPILL REPORT LINE (867) 920-8130

INITIAL SPILL RESPONSE

- The Manager, Environmental Affairs or designate shall be informed of the incident and the response team action initiated. **Spill reported via 24 hour emergency spill line**, above;
- **STOP** the spill of ANFO at the source if possible;
- evacuate all non-essential personnel from the area and ensure the health and safety of those remaining;
- **ELIMINATE** all possible sources of ignition;
- **PREVENT** ANFO from contacting water;
- if ANFO does contact water, **CONTAIN** solution to as small an area as possible. Consider dyking with sand or snow to minimize travel;
- **ISOLATE** area of spill preferably by roping off affected area.
- A detailed spill report shall be submitted as per Section 2.3

HAZARDS

- may explode under confinement or high temperatures and friction;
- avoid contact with strong oxidizers (ie: Lead Nitrate)
- flammable;
- combustion products are toxic and may include hydrocarbons, oxides of carbon and nitrogen;
- low toxicity.

ACTION FOR FIRE

- for fires involving large quantities of ANFO, evacuate and **Do Not Attempt** to fight fires;
- for fires involving small quantities of unconfined ANFO, use large amounts of water to extinguish, control runoff;

- ANFO may detonate in fire, under severe impact or confinement.

RECOVERY

- spills of ANFO on dry surfaces can simply be shoveled into containers;
- spills of ANFO on wet surfaces or exposed to rain should be shoveled into waterproof containers as soon as possible to minimize the quantity of ammonium nitrate being dissolved;
- ANFO, or a resulting ammonium nitrate solution, must not be allowed access to any flowing stream;
- absorbents such as peat moss, Conwed or Graboil should be used to recover any oil emanating from the ANFO spill; snow may be used during the winter months under freezing conditions.
- soil heavily contaminated with ammonium nitrate should be excavated for incineration if any affected groundwater threatens to travel to an adjacent flowing stream.

DISPOSAL

- ANFO recovered from a spill may be used in the mine;
- ammonium nitrate solutions and soil containing ammonium nitrate should be disposed of underground in a crown pillar open stope accessible from surface;
- absorbents used to recover the oil may be incinerated under controlled conditions or buried at an approved site;
- ANFO can be disposed of by detonation or incineration under knowledgeable supervision.

PROPERTIES

- comprised of 94% prilled ammonium nitrate (NH_4NO_3) and 6% No.2 fuel oil, trade name: Amex II
- small porous pellets coated with oil, may be dyed with bright colours (yellow), odour of fuel oil;
- ammonium nitrate is Very Soluble in water; the oil is not soluble and will float;
- strong oxidizing agent;

- flammable.

ENVIRONMENTAL CONCERNS

- ammonium nitrate is moderately toxic to fish and other aquatic organisms at low concentrations. Toxicity increases with increased pH and temperature of the water.
- being very water soluble, the ammonium nitrate in the ANFO can readily dissolve and enter the natural surface or ground water streams.

CONTAINERS

- ANFO is transported and stored in 25 kg polyethylene bags at the main explosives magazine.

SUPPLIER

- Explosives Limited (Calgary, Alberta)
- SEE ATTACHED MSDS FOR ADDITIONAL INFORMATION

APPENDIX I

TELEPHONE LISTINGS & COMMUNICATIONS

TELEPHONE LISTINGS

LUPIN MINE, NUNAVUT	**TELEPHONE**
Manager, Environmental Affairs, Zinifex Canada Inc. Mr. Andrew Mitchell	(807) 346-1668
Exploration Manager, Izok Camp Mr. Dave Stevenson	(416) 987-0357
Camp Manager, Izok Camp, Zinifex Canada Inc. Casey Lunn/Randy Oinenen	(416) 987-0357

It shall be the responsibility of the Manager, Environmental Affairs or his designate to notify:

CEO, Zinifex Canada Inc. Mr. Ewan Downie	(807) 346-1667
COO, Zinifex Canada Inc. Mr. John Begeman	(807) 346-1693

TELEPHONE LISTING

GOVERNMENT AGENCIES	TELEPHONE	FACSIMILE
24 HOUR SPILL REPORT LINE (Yellowknife)	**(867) 920-8130**	**(867) 873-6924**
INAC Water Resources Inspector (Iqaluit)	(867) 975-4289	
NUNAVUT WATER BOARD	(867) 360-6338	(867) 360-6369
GOVERNMENT NWT – Department of Renewable Resources		
Environmental Protection, Yellowknife		
Ken Hall; Manager Env. Prot.	(867) 920-6476	(867) 873-0221
Harvey Gaukel; Hazmat Specialist	(867) 873-7645	(867) 873-0221
Wildlife Management Division		
Wildlife Biologist	(867) 920-6190	(867) 873-0293
GOVERNMENT OF NUNAVUT		
Environmental Protection, Iqaluit	(867) 975-5910	(867) 975-5980
GOVERNMENT OF CANADA		
Indian and Northern Affairs Canada-Land Use and Water Use		
Regulatory Approvals, Water Resources	(867) 669-2650	(867) 669-2716
Land Use; Reg. Manager, Land	(867) 669-2763	(867) 669-2731
Nunavut District Office; Iqaluit (Water)	(867) 979-4407	(867) 979-6445
Andrew Kein, Water Resources Inspector, Iqaluit	(867) 975-4289	
Environment Canada		
Environment Canada, Iqaluit	(867) 975-4644	
24-hour emergency pager	(867) 920-5131	
Department of Fisheries and Oceans		
Fisheries Habitat Biologist (Iqaluit)	(867) 979-8007	(867) 979-8039
OTHERS		
Kitikmeot Inuit Association, Kugluktuk	(867) 982-3310	(867) 982-3311
Kugluktuk Hunters and Trappers Assoc.	(867) 982-4908	(867) 982-4047

ADDITIONAL COMMUNICATIONS

Winter Road Camps & Vehicles:

Radio	LAD-1 154.100 MHz
Yellowknife Dispatch	(867) 873-9111
Lac de Gras	(780) 644-9083
Lockhart Lake	(780) 644-9077
Dome Lake	(780) 644-9088
Incident Commander (Erik Madsen, DDMI)	(867) 669-6561

Winter Road Operations (Nuna)

Safety Manager (Neil Thompson)	(780) 434-7758
Operations Manager (Pat McHale)	(780) 434-9434

EMERGENCY CONTACTS

Invista (formerly Dupont)	(613) 348-3616
Chemtrec	1-800 262-8200

Absorbents:

Conweb & Oil Snare Canadian Industries Ltd .	(780) 465-0221
Alberta Oil Spill Consultants	(780) 451-0585
(Booms, absorbents, skimmers)	

APPENDIX II

FIGURES

FIGURE 1: RESPONSE TEAM FLOWSHEET

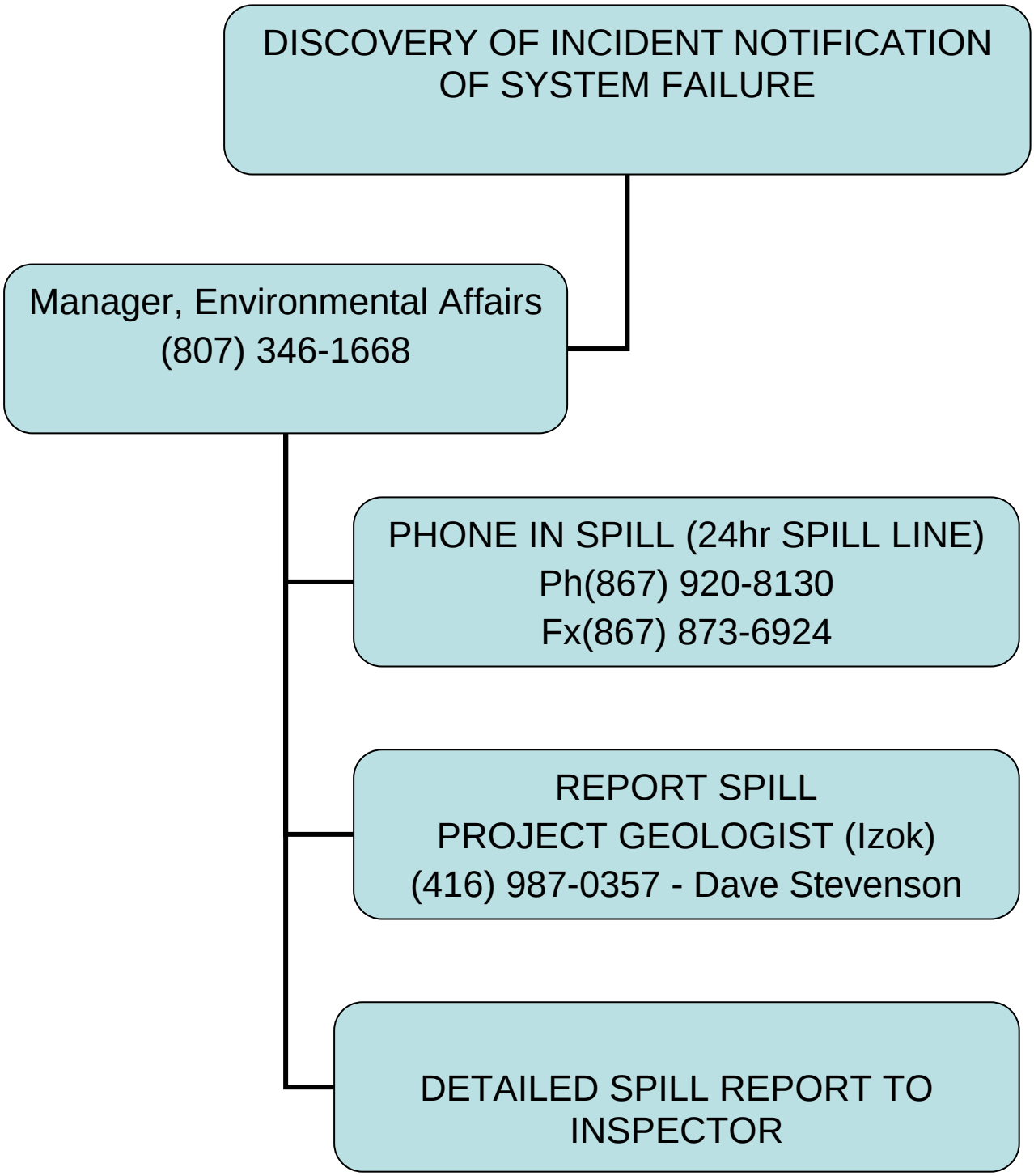


FIGURE 2: SPILL REPORT FORM

Northwest Territories | Nunavut | Canada

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	☐ ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER ____-_____
B	OCCURRENCE DATE: MONTH – DAY – YEAR	OCCURRENCE TIME		
C	LAND USE PERMIT NUMBER (IF APPLICABLE)	WATER LICENCE NUMBER (IF APPLICABLE)		
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION	REGION ☐ NWT ☐ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN		
E	LATITUDE DEGREES MINUTES SECONDS	LONGITUDE DEGREES MINUTES SECONDS		
F	RESPONSIBLE PARTY OR VESSEL NAME	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION		
G	ANY CONTRACTOR INVOLVED	CONTRACTOR ADDRESS OR OFFICE LOCATION		
H	PRODUCT SPILLED	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	
J	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			

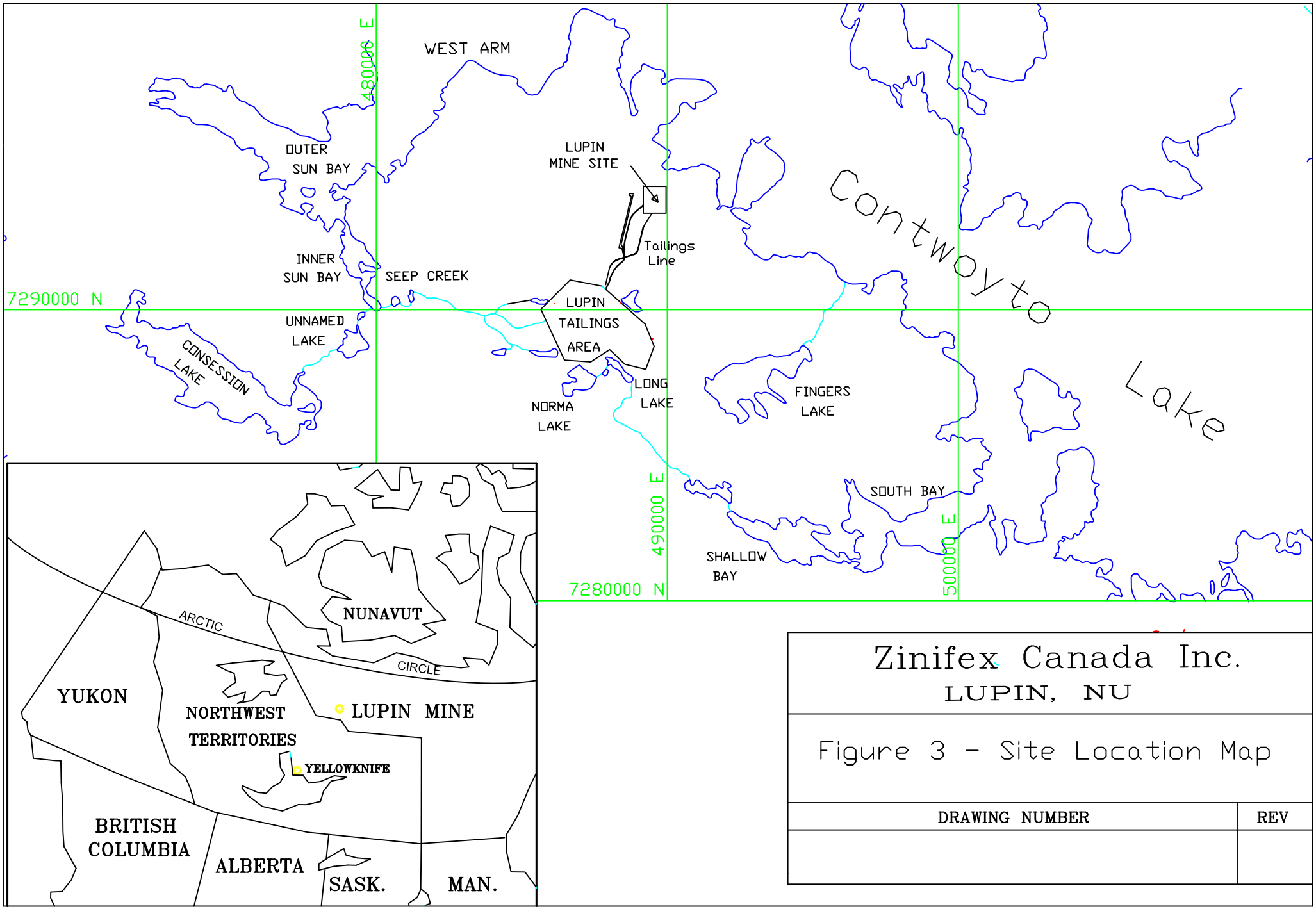
L	REPORTED TO SPILL LINE BY	POSITION	EMPLOYER	LOCATION CALLING FROM	TELEPHONE
M	ANY ALTERNATE CONTACT	POSITION	EMPLOYER	ALTERNATE CONTACT LOCATION	ALTERNATE TELEPHONE

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

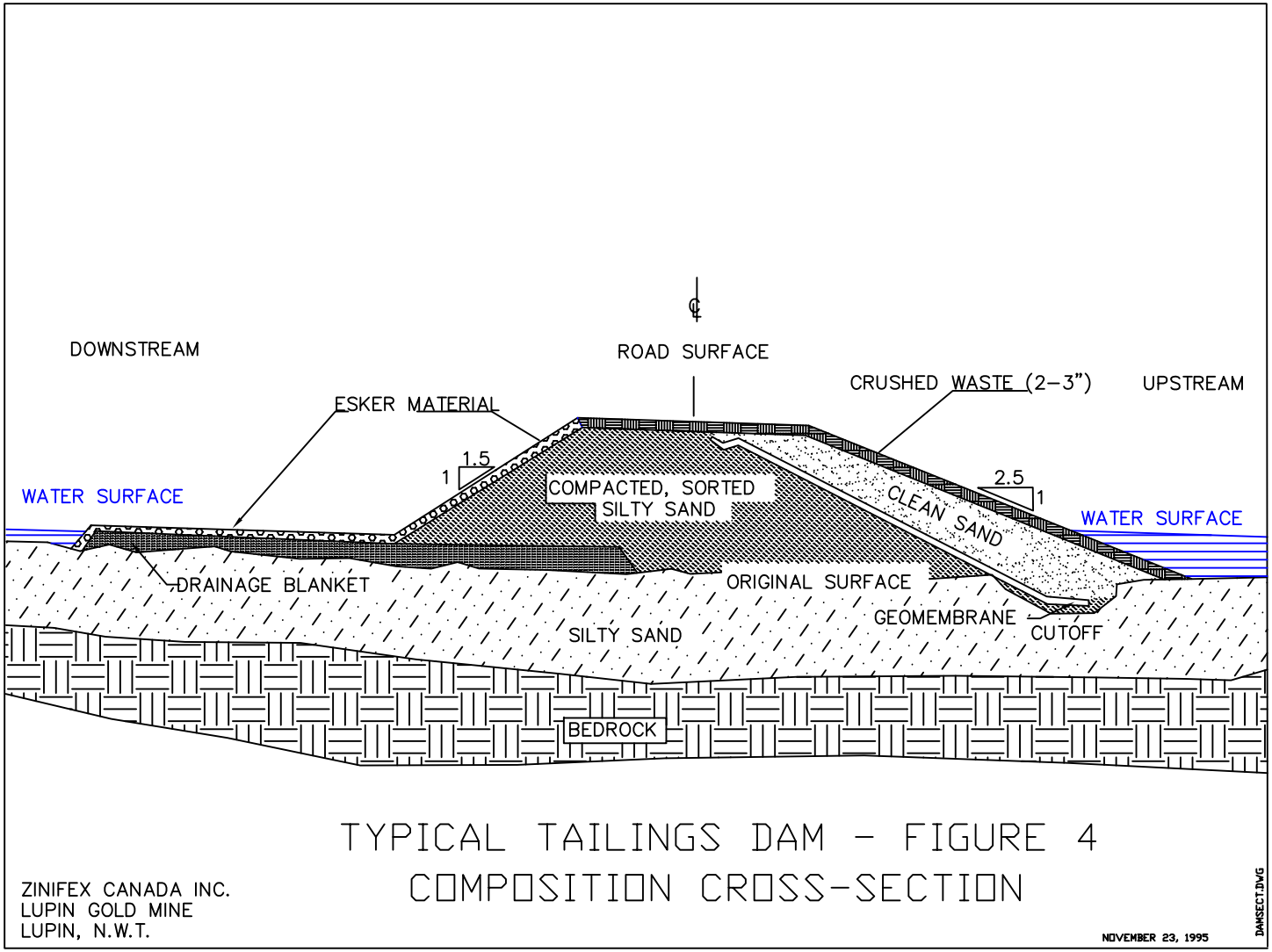


Zinifex Canada Inc.

LUPIN, NU

Figure 3 - Site Location Map

DRAWING NUMBER	REV



MAP SCALE	REVISIONS	No	DATE	MADE BY	DESCRIPTION
0 50 100 METERS		1			
		2			
		3			
		4			
		5			

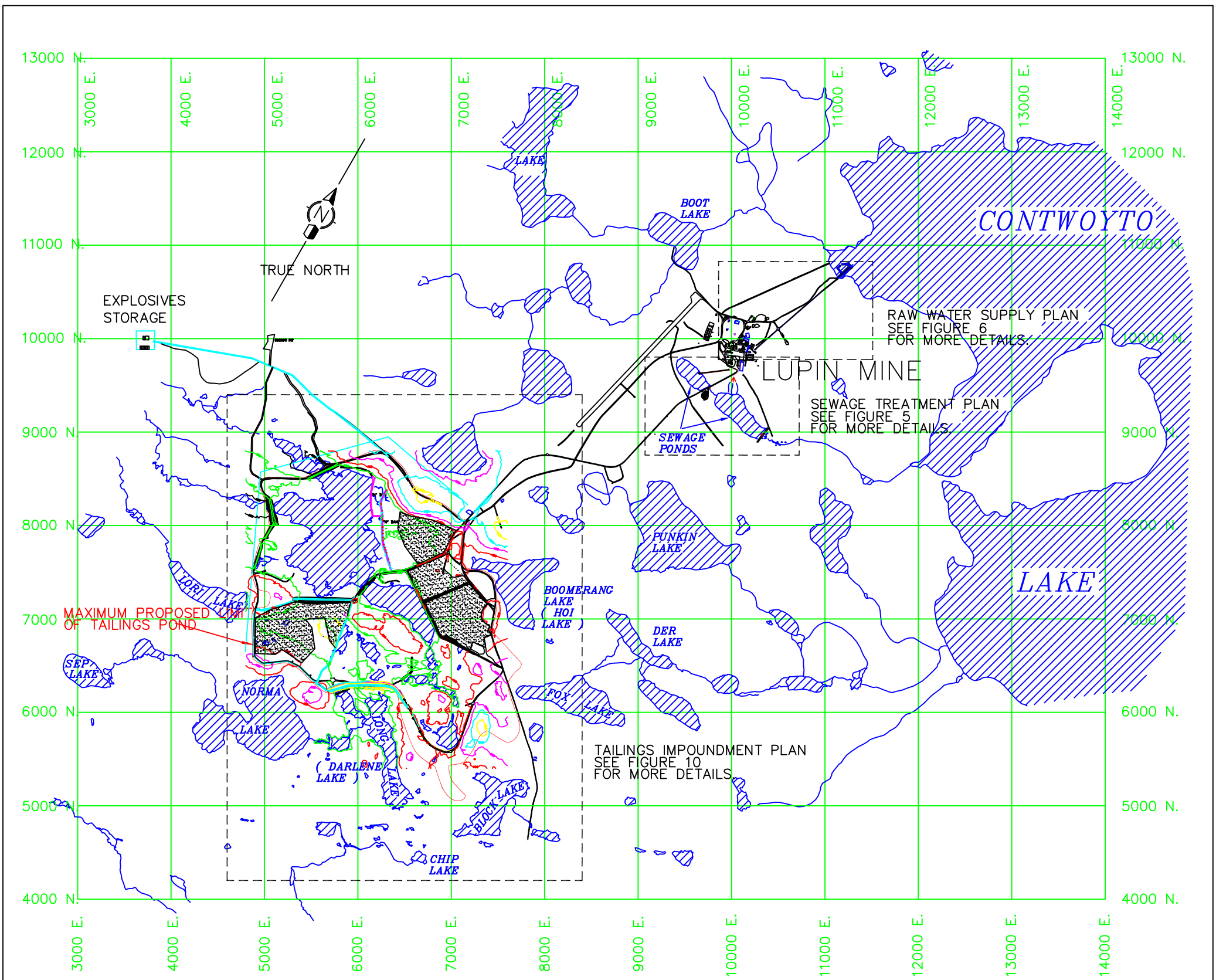
DATE	DRAWN BY	CHECKED	APPROVED
4/30/90	E.PETERS		

ZINIFEX CANADA INC.
Figure 4 – Dam Cross–Section

OFFICE	DEPARTMENT
LUPIN	ENVIRONMENTAL

LUPIN MINE
RAW WATER SUPPLY PLAN
GENERAL ARRANGEMENT

MAP INDEX NUMBER	SCALE	DRAWING NUMBER
	N.T.S.	LUWAT04.DWG



MAP SCALE	REVISIONS				
0 250 500 750 1000 METERS	No	DATE	MADE BY	DESCRIPTION	
	1	MAR/95	S.B.L.	UPDATED TO MARCH 1995	
	2	FEB/04	CMT	UPDATED TO FEB 2004	
	3	FEB/06	CMT	UPDATED TO FEB 2006	
	4				
	5				
	DATE	DRAWN BY	CHECKED	APPROVED	
	4/30/90	E.PETERS			

ZINIFEX CANADA INC.		
OFFICE	DEPARTMENT	
LUPIN	ENVIRONMENTAL	

FIGURE 5
LUPIN SITE PLAN
GENERAL ARRANGEMENT

MAP INDEX NUMBER	SCALE	DRAWING NUMBER
		LUSIT06.DWG

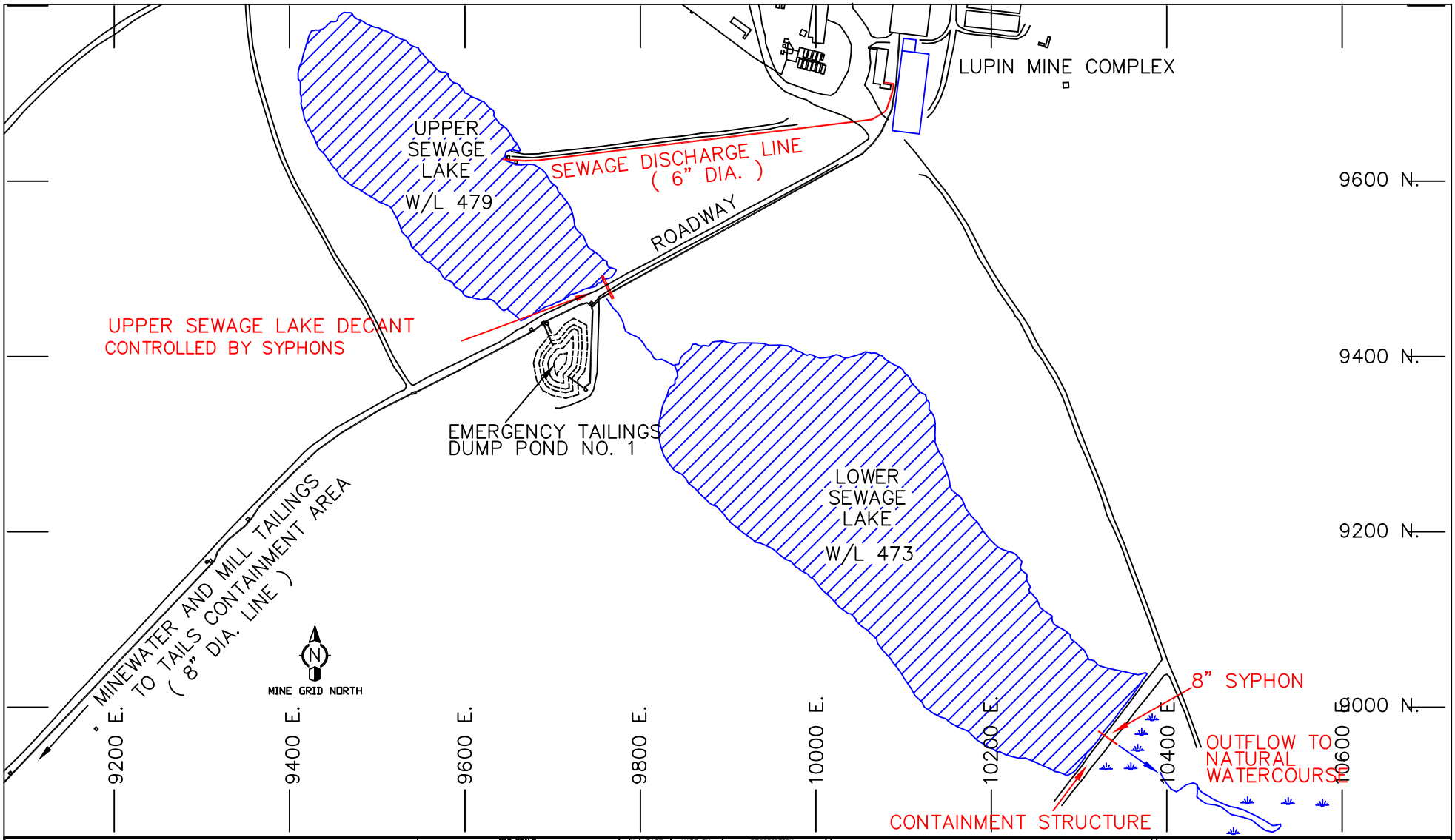


Figure 6 – Lupin Sewage Treatment Plan

MAP SCALE
0 50 100
METERS
1 : 2000

REVISIONS	No	DATE	MADE BY	DESCRIPTION
	1	MAR/95	S.B.L.	UPDATED TO MARCH 1995
	2	DEC/00	S.B.L.	UPDATED TO DEC 2000
	3	DEC/03	CMT	UPDATED TO DEC 2003
	4			
	5			

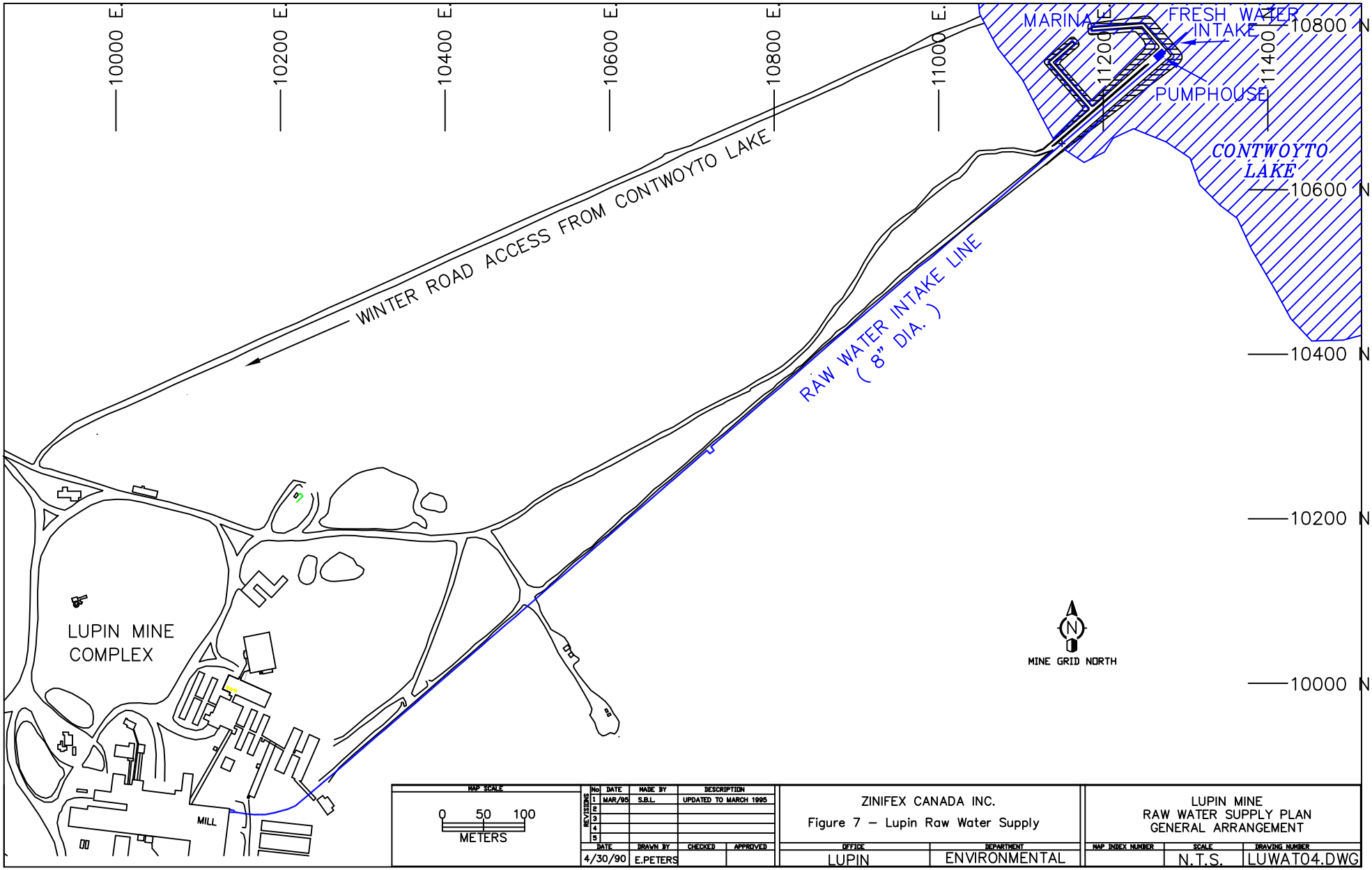
DATE	DRAWN BY	CHECKED	APPROVED
4/30/90	E.PETERS		

ZINIFEX CANADA INC.

OFFICE	DEPARTMENT
LUPIN	ENVIRONMENTAL

LUPIN MINE
SEWAGE TREATMENT PLAN
GENERAL ARRANGEMENT

MAP INDEX NUMBER	SCALE	DRAWING NUMBER
	N.T.S.	LUSEW04.DWG



REVISIONS	No	DATE	MADE BY	DESCRIPTION
	1	MAR/95	S.B.L.	UPDATED TO MARCH 1995
	2			
	3			
	4			
	5			

DATE	DRAWN BY	CHECKED	APPROVED
4/30/90	E.PETERS		

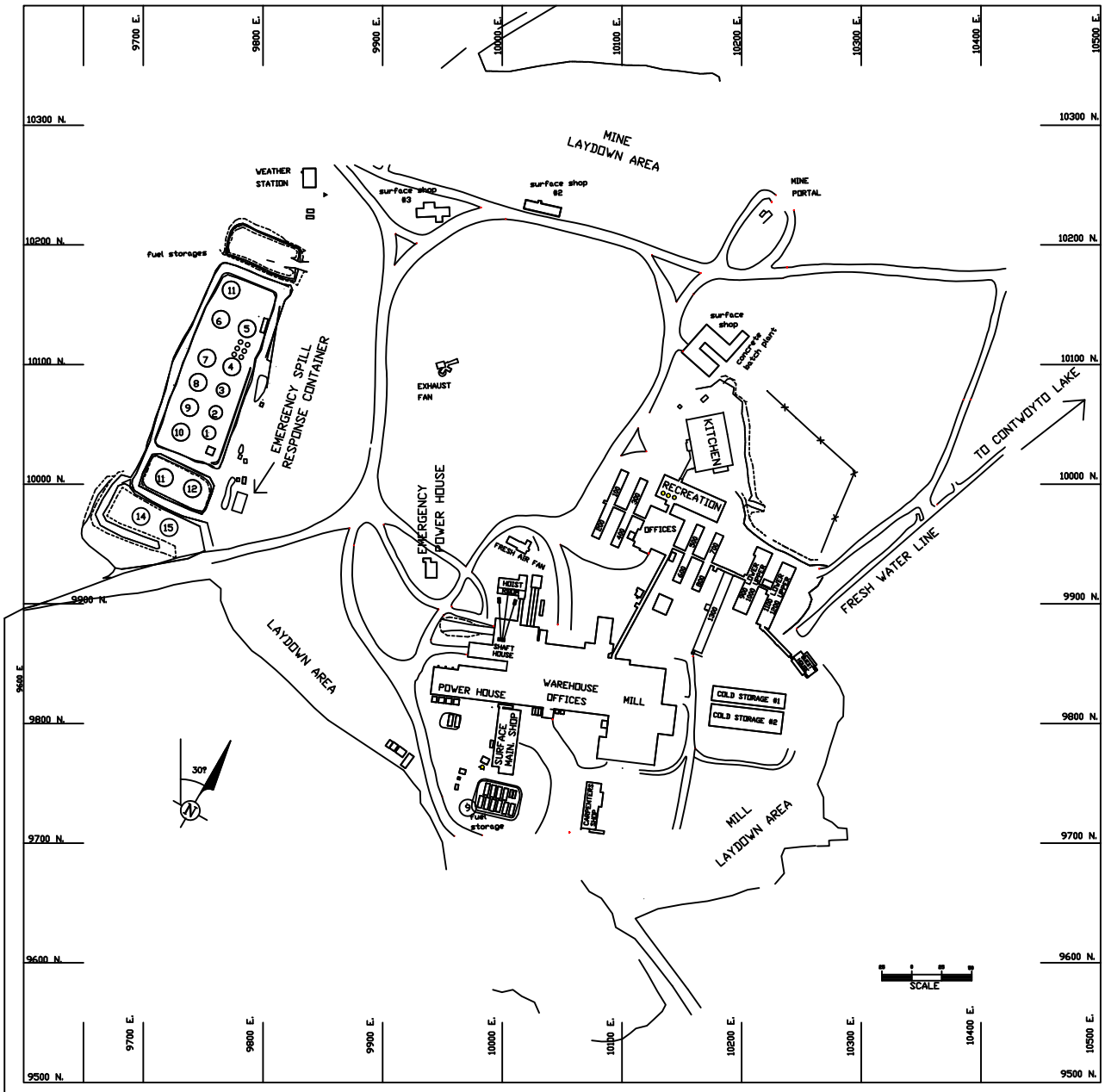
ZINIFEX CANADA INC.

Figure 7 – Lupin Raw Water Supply

OFFICE	DEPARTMENT
LUPIN	ENVIRONMENTAL

LUPIN MINE
RAW WATER SUPPLY PLAN
GENERAL ARRANGEMENT

MAP INDEX NUMBER	SCALE	DRAWING NUMBER
	N.T.S.	LUWAT04.DWG



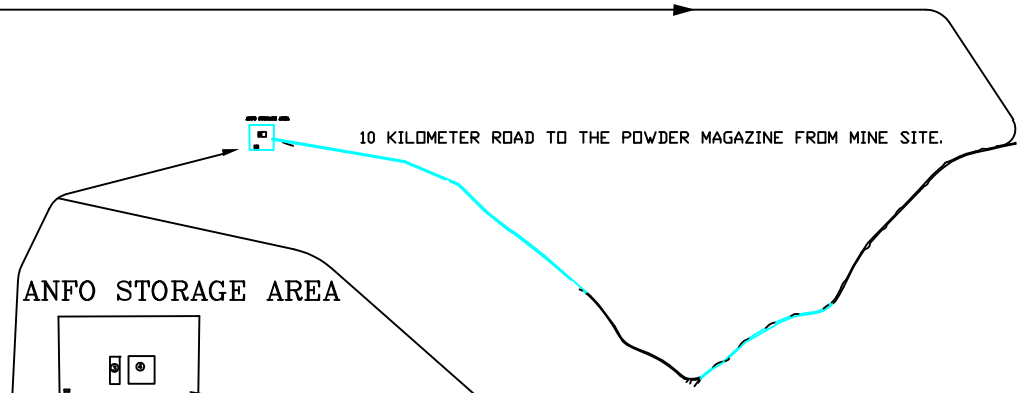


FIGURE 8

CONTENGENCY PLAN

MAP SCALE: 0 50 100 200 METERS

NO.	DATE	MADE BY	DESCRIPTION
1	Dec/00	S.B.L.	Updated to Dec/00
2	Feb/04	CMT	Updated to Feb/04

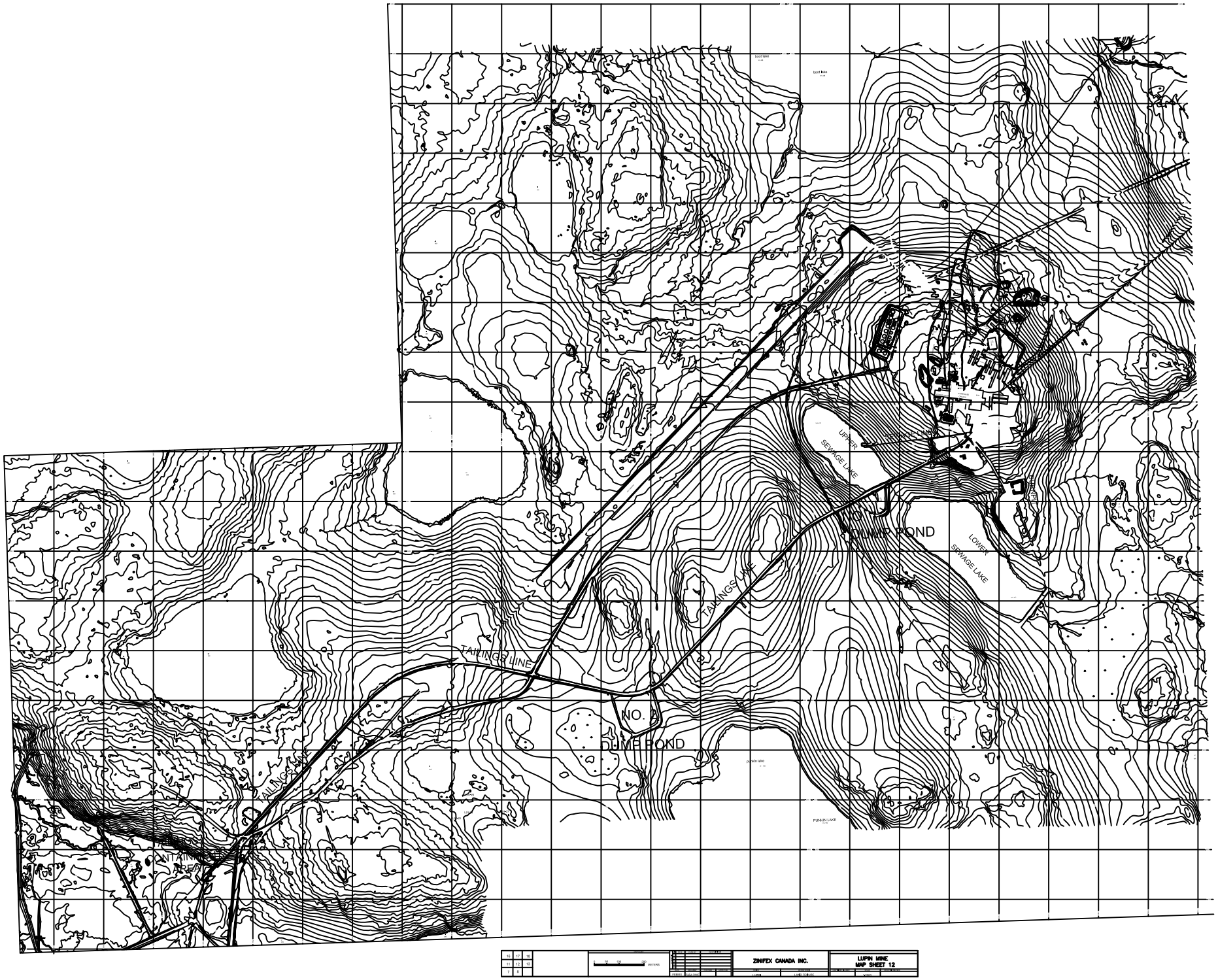
DRAWN BY: S.B.LOWE

ZINIFEX CANADA INC.

OFFICE: LUPIN DEPARTMENT: DEVELOPMENT

LUPIN MINE
SITE PLAN / POWDER MAGAZINE

MAP INDEX NUMBER | SCALE: N.T.S. | DRAWING NUMBER: STORAGE.DWG


boot lake
UPPER SEWAGE LAKE
LOWER SEWAGE LAKE
DUMP POND
TAILINGS LINE
NO. 2 DUMP POND
CONTAINMENT AREA
punkin lake
PUNKIN LAKE
ZINIFEX CANADA INC.
LUPIN MINE
MAP SHEET 12

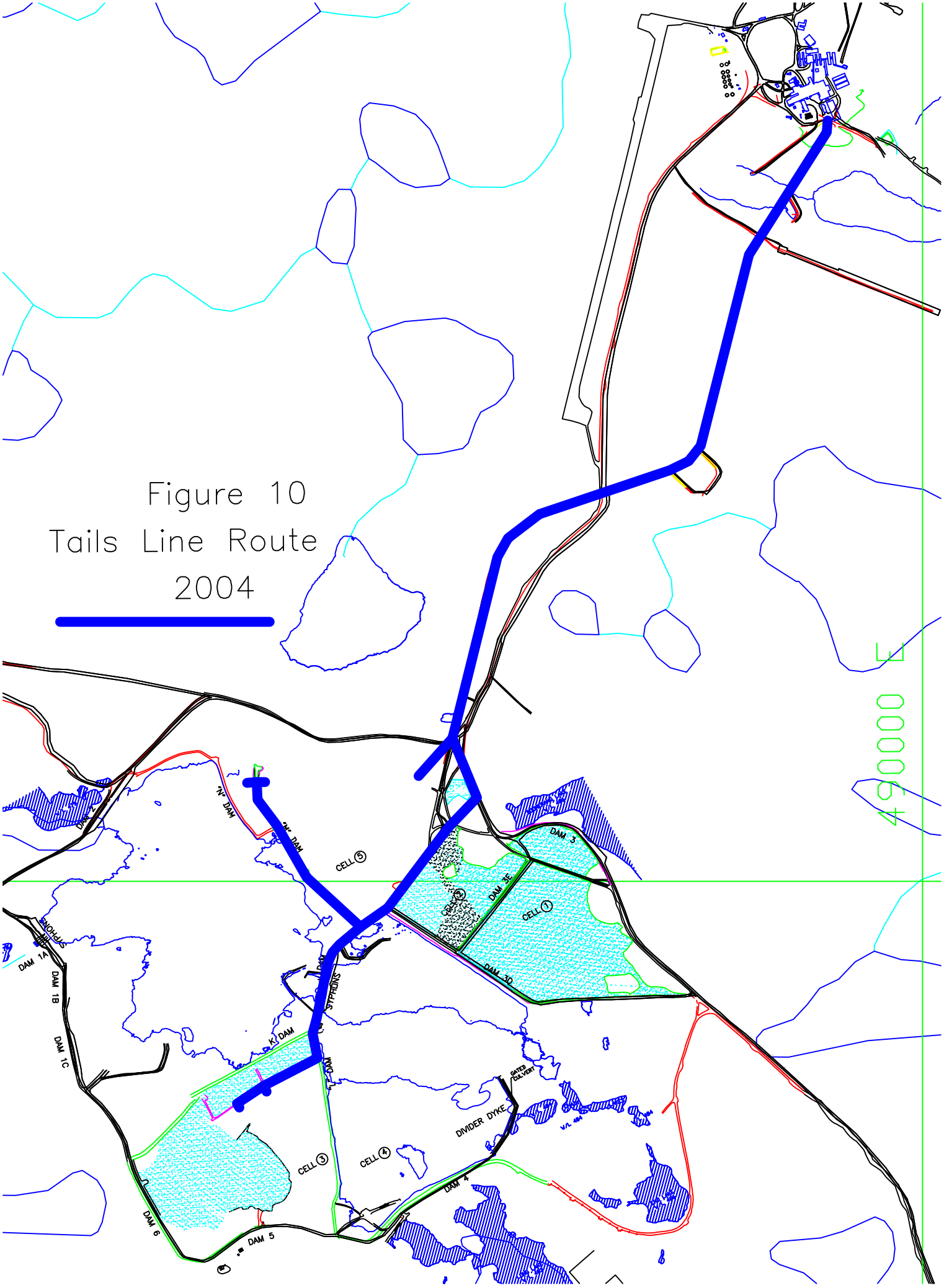


Figure 10
Tails Line Route
2004
490000 E
DAM 1A
DAM 1B
DAM 1C
DAM 2
DAM 3
DAM 3E
DAM 3D
DAM 4
DAM 5
DAM 6
CELL 1
CELL 2
CELL 3
CELL 4
CELL 5
DIVIDER DYKE
GATED CULVERT
SYPHONS

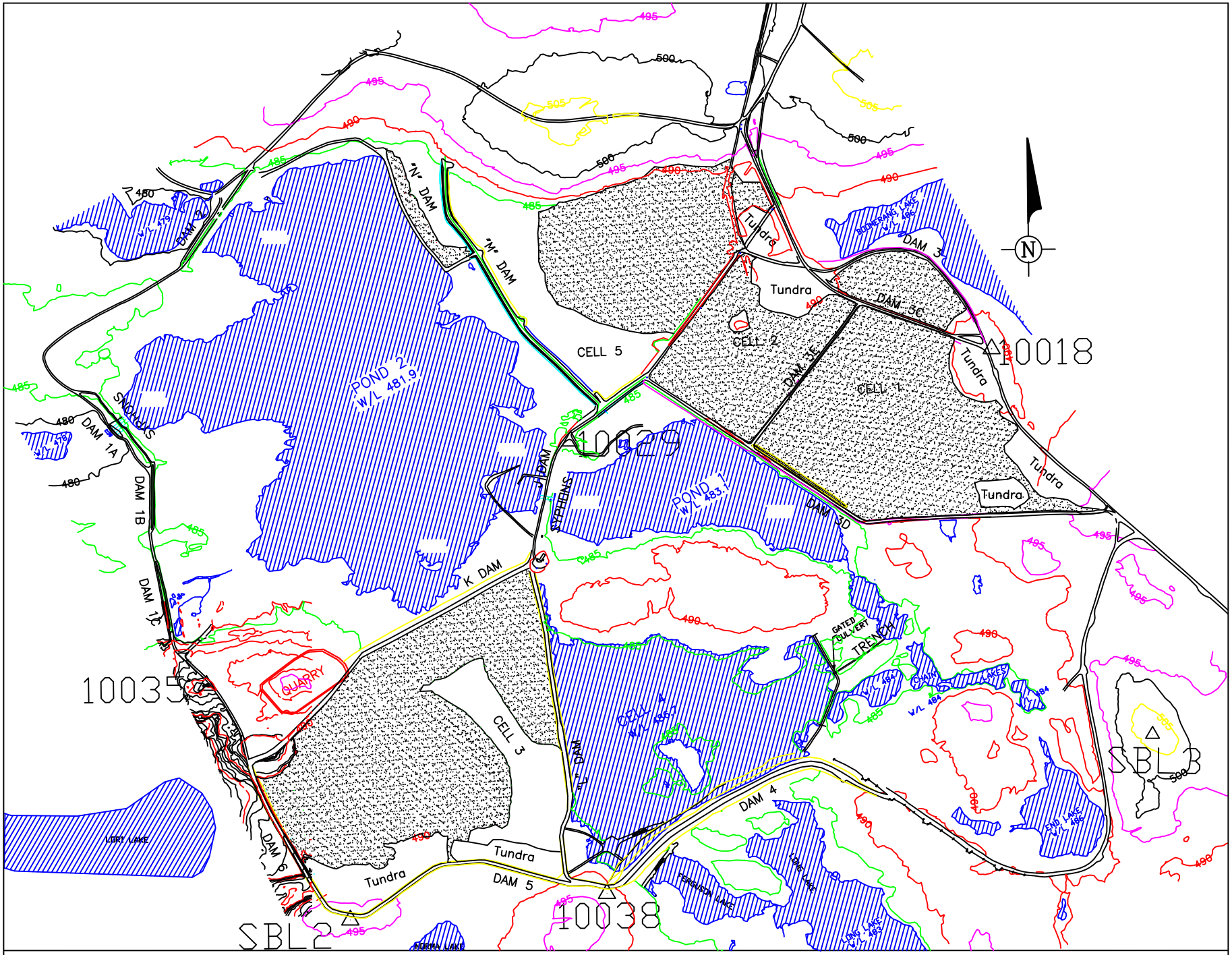


FIGURE 11

MAP SCALE
0 50 100 200 METERS

No	DATE	MADE BY	DESCRIPTION
1	Oct/03	CMT	Updated Cell 3a, 3b
2	Jun/04	CMT	Pond L2 water levels
3	Aug/04	CMT	Cell 4 water
4	Sep/05	CMT	2004 Talks cover
5	Sep/05	CMT	2005 Talks cover

REVISIONS

DATE	DRAWN BY	CHECKED	APPROVED
2005 Lupin TCA.dwg			

Zinifex Canada Inc
LUPIN MINE

OFFICE	DEPARTMENT
LUPIN	DEVELOPMENT

LUPIN MINE
TAILINGS AREA

MAP INDEX NUMBER	SCALE	DRAWING NUMBER

APPENDIX III

TABLES

TABLE 1 - PETROLEUM AND CHEMICAL PRODUCTS INVENTORY MAJOR COMPONENTS

PRODUCT	QUANTITY (31-March-06)	STORAGE UNITS	# OF UNITS SOH (WRRS)	STORAGE LOCATION
P40 FUEL	463,563 Imp Gal	350,000 Imp Gal 360,000 Imp Gal 18,000 Imp Gal	9 2 6	Main Tank Farm Main Tank Farm Satellite Tank Farm
P50 FUEL	47,618 Imp Gal	187,000 Imp Gal 18,000 Imp Gal	3 4	Main Tank Farm Satellite Tank Farm
GASOLINE	546 Imp Gal	5,000 Imp Gal	2	Satellite Tank Farm
JET A/B	126,936 Imp Gal	360,000 Imp Gal	1	Main Tank Farm
RALUBE 40	40,000 L	Super-B tanker	1	Main Tank Farm
W30 LUBE OIL	38,400 L	1,600 L, Cubes	24 cubes	Main Tank Farm
HYDRATED LIME	157.8 mt	25 kg Bag	6313 bags	Cold Storage 2
ANFO (AMEX II)	81 mt	25 kg Bag	3250 bags	Main Magazine
PORTLAND TYPE 10 PORTLAND TYPE 30	10 mt 53.9 mt	25-kg Bag	400 bags 2156 bags	Cold Storage 2
Magnafrac 25 x 300 Magnafrac 32 x 300 Xactex 19 x 600	4025 kg 400 kg 1125 kg	25 kg Case	161 cases 16 cases 45 cases	Main Magazine
BATTERY ACID	360 L	20 L Container	18 ea	Cold Storage 2

TABLE 2 - HEAVY EQUIPMENT INVENTORY
LUPIN MINE, NUNAVUT

No.	Description
2	Komatsu WA250 Loaders
1 1	Cat 966C Wheel Loader Cat 966G Wheel Loader
1	Cat 14H Grader
1	Grove Crane (20 T)
2	Volvo Haul Truck (20t)
1	Ford 9000 Truck
1	Flat Deck Truck
1	D85 Komatsu Dozer
5	Pickup Trucks

TABLE 3 - SPILL CONTAINMENT/RECOVERY MATERIALS

Spill containment/recovery materials located at Lupin within the "Emergency Spill Response Van" container, centrally located adjacent to the fuel tank farm receiving station (see Fig. 7) contains the following inventory:

3	Shovels;
2	Roll Poly; 4mL, 500 ft.;
1	Crate of floordry; (50) 20kg bags;
4	Booms, 11 ft
1	Pump; 2" Honda;
2	Safety approved 2 gallon gas container;
2	20 ft. 2" hoses;
10	45 gallon drums (no lids) for collection of contaminated materials;
1	100 ft. rope;
2	fire extinguishers;
1	4 lb sledge;
1	Box, dust masks
1	Chainsaw
1	Gas ice auger
2	Chemical Resistant Safety Gloves

In addition to the above, the on-site Lupin warehouse maintains a supply of the smaller items such as floordry, absorbent pads, shovels, dust masks. If additional equipment is required during a clean-up procedure warehouse issues are readily available.

APPENDIX IV

REFERENCES

REFERENCES

- Guidelines for Contingency Planning
  Northwest Territories Water Board, 1987

- Contingency Planning And Spill Reporting In The NWT
  A Guide To The New Regulations; unauthored, GNWT

- Guidelines For The Preparation of Hazardous Material Spill Contingency Plans;
  Environmental Protection, W&N Region, Report No. CP(EP) ENR90-91-4
  March 1990

- Oil And Toxic Material Spill Contingency Plan
  Kinross Gold Corp., 1984, updated annually

- Contingency Plan; Kinross Gold Corp.
  June 2005, Updated annually

- Polaris Operations Contingency Plan;
  Cominco Ltd, Polaris , N.W.T.; June 1994

- Guidelines For Preparing Spill Contingency Plans For Winter Road Operations In The Northwest Territories; E. Paquin, GNWT; D. Stendahl, NAP/INAC; D. Tilden, EPS/DOE; October 1983

- The Environmental Protection Act of The Northwest Territories; Spill Contingency Planning and Reporting Regulations, Registered July 22, 1993

- BHP Ekati Diamond Mine Spill and General Contingency Plan, 1999.

APPENDIX V

MATERIAL SAFETY DATA SHEETS

- ***Diesel fuel***
- ***Jet-A fuel***
- ***Jet-B fuel***
- ***Gasoline***
- ***Ralube 40 CF***
- ***Motor Oil***
- ***Ucartherm Glycol***
- ***Magnafrac***
- ***Hydrated Lime***
- ***Portland Cement***

PETRO-CANADA

Material Safety Data Sheet

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

Section 1. Chemical Product and Company Identification

Product Name	**DIESEL FUEL**	**Code**	W104, W293 SAP: 120, 121, 122, 287
		Validated on	**8/17/2005.**
Synonym	Diesel 50, Diesel 50 LS, #1 Diesel , #1 Diesel LS, Diesel LC, Seasonal Diesel, Seasonal Diesel LS, Diesel AA, Domestic Marine Diesel, International marine Diesel, Seasonal Diesel Locomotive, Domestic Marine diesel LS, diesel -20°C (LS), LSD, Low Sulphur Diesel, dyed diesel, marked diesel, coloured diesel, Naval Distillate, Ultra Low Sulphur Diesel, ULS Diesel, Mining Diesel, Mining Diesel Special, Mining Diesel Special LS, High Flash Mining Diesel, Furnace Oil, Stove Oil.		
Manufacturer	PETRO-CANADA P.O. Box 2844 Calgary, Alberta T2P 3E3	**In case of Emergency**	Petro-Canada: 403-296-3000 Canutec Transportation: 613-996-6666 Poison Control Centre: Consult local telephone directory for emergency number(s).
Material Uses	Diesel fuels are distillate fuels suitable for use in high and medium speed internal combustion engines of the compression ignition type. Mining Diesel has a higher flash point requirement, for safe use in underground mines.		

Section 2. Composition and Information on Ingredients

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

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

Section 3. Hazards Identification.

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

Section 4. First Aid Measures

Eye Contact	Avoid direct contact. Quickly and gently blot or brush away chemical. Immediately flush the contaminated eye(s) with lukewarm, gently flowing water for 15 minutes or until the chemical is removed, while holding the eyelid(s) open. Take care not to rinse contaminated water into the unaffected eye or onto the face. Obtain medical attention immediately.
Skin Contact	Avoid direct contact. Wear chemical resistant protective clothing if necessary. Quickly and gently, blot or brush away excess chemical. Wash gently and thoroughly with warm water and non-abrasive soap for 15 minutes or until chemical is removed. Under running water, remove contaminated clothing, shoes and leather goods (e.g., watch bands, belts, etc.). Obtain medical attention immediately. Completely decontaminate clothing, shoes and leather goods before reuse or discard.
Inhalation	Take proper precautions to ensure your own safety before attempting rescue (e.g. wear appropriate protective equipment). If breathing has stopped, trained personnel should begin artificial respiration (AR) or, if the heart has stopped, cardiopulmonary resuscitation (CPR) immediately. Immediately transport victim to an emergency care facility.

Continued on Next Page

Ingestion	NEVER give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing. Have victim rinse mouth thoroughly with water. DO NOT INDUCE VOMITING. Have victim drink 240 to 300 mL (8 to 10 oz) of water to dilute material in stomach. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration. Repeat administration of water. If breathing has stopped, trained personnel should begin artificial respiration (AR) or, if the heart has stopped, cardiopulmonary resuscitation (CPR) immediately. Quickly transport victim to an emergency care facility.
Note to Physician	Not available

Section 5. Fire-fighting Measures

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

Section 6. Accidental Release Measures

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

Section 7. Handling and Storage

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

Section 8. Exposure Controls/Personal Protection

Engineering Controls	For normal application, special ventilation is not necessary. If user's operations generate vapours or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. Make-up air should always be supplied to balance air removed by exhaust ventilation. Ensure that eyewash station and safety shower are close to work-station.
Personal Protection - ***The selection of personal protective equipment varies, depending upon conditions of use.***	
Eyes	As a minimum, safety glasses with side shields should be worn when handling this material. If product is used in an application where splashing may occur, the use of safety goggles and/or a face shield should be considered.
Body	If this material may come in contact with the body during handling and use, we recommend wearing appropriate protective clothing to prevent contact with the skin. (Contact your PPE provider for more information.)
Respiratory	A NIOSH-approved air-purifying respirator with an organic vapour cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. Use a positive-pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstances where air-purifying respirators may not provide adequate protection.
Hands	If this material may come in contact with the hands during handling and use, we recommend wearing gloves of the following material(s): nitrile, neoprene, polyvinyl alcohol (PVA), fluoro-elastomer. Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns. It should be realized that eventually any material regardless of their imperviousness, will get permeated by chemicals. Therefore, protective gloves should be regularly checked for wear and tear. At the first signs of hardening and cracks, they should be changed.
Feet	Wear appropriate footwear to prevent product from coming in contact with feet and skin.

Section 9. Physical and Chemical Properties

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

Section 10. Stability and Reactivity

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

Section 11. Toxicological Information

Routes of Entry	Skin contact, eye contact, inhalation, and ingestion.
Acute Lethality	Acute oral toxicity (LD50): 7500 mg/kg (rat).
Chronic or Other Toxic Effects	
Dermal Route:	This product contains a component (at >= 1%) that can cause skin irritation. Therefore, this product is considered to be a skin irritant. Prolonged or repeated contact may defat and dry skin, and cause dermatitis. (See Other Considerations)
Inhalation Route:	Inhalation of this product may cause respiratory tract irritation. Inhalation of this product may cause Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.

Oral Route:	Ingestion of this product may cause gastro-intestinal irritation. Aspiration of this product may result in severe irritation or burns to the respiratory tract. Ingestion of this product may cause Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.
Eye Irritation/Inflammation:	This product contains a component (at >= 1%) that can cause eye irritation. Therefore, this product is considered to be an eye irritant.
Immunotoxicity:	Not available
Skin Sensitization:	Contact with this product is not expected to cause skin sensitization, based upon the available data and the known hazards of the components.
Respiratory Tract Sensitization:	Contact with this product is not expected to cause respiratory tract sensitization, based upon the available data and the known hazards of the components.
Mutagenic:	This product is not known to contain any components at >= 0.1% that have been shown to cause mutagenicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a mutagen.
Reproductive Toxicity:	This product is not known to contain any components at >= 0.1% that have been shown to cause reproductive toxicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a reproductive toxin.
Teratogenicity/Embryotoxicity:	This product is not known to contain any components at >= 0.1% that have been shown to cause teratogenicity and/or embryotoxicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a teratogen/embryotoxin.
Carcinogenicity (ACGIH):	ACGIH A3: animal carcinogen. [Diesel oil] (See Other Considerations)
Carcinogenicity (IARC):	This product is not known to contain any chemicals at reportable quantities that are listed as Group 1, 2A, or 2B carcinogens by IARC.
Carcinogenicity (NTP):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by NTP.
Carcinogenicity (IRIS):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by IRIS.
Carcinogenicity (OSHA):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by OSHA.
Other Considerations	Avoid prolonged or repeated skin contact to diesel fuels which can lead to dermal irritation and may be associated with an increased risk of skin cancer. Diesel engine exhaust particulate is probably carcinogenic to humans (IARC Group 2A).

Section 12. Ecological Information

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

Section 13. Disposal Considerations

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

Section 14. Transport Information

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

Section 15. Regulatory Information

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

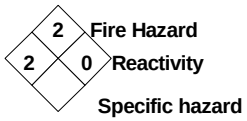
Please contact Product Safety for more information.

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

HMIS (U.S.A.)

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

NFPA (U.S.A.)



Rating
0 Insignificant
1 Slight
2 Moderate
3 High
4 Extreme

Section 16. Other Information

References Available upon request.
* Marque de commerce de Petro-Canada - Trademark

Glossary

ACGIH - American Conference of Governmental Industrial Hygienists
ADR - Agreement on Dangerous goods by Road (Europe)
ASTM - American Society for Testing and Materials
BOD5 - Biological Oxygen Demand in 5 days
CAN/CGA B149.2 Propane Installation Code
CAS - Chemical Abstract Services
CEPA - Canadian Environmental Protection Act
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CFR - Code of Federal Regulations
CHIP - Chemicals Hazard Information and Packaging Approved Supply List
CNS - Central Nervous System
COD5 - Chemical Oxygen Demand in 5 days
CPR - Controlled Products Regulations
DOT - Department of Transport
DSCL - Dangerous Substances Classification and Labeling (Europe)
DSD/DPD - Dangerous Substances or Dangerous Preparations Directives (Europe)
DSL - Domestic Substance List
EEC/EU - European Economic Community/European Union
EINECS - European Inventory of Existing Commercial Chemical Substances
EPA - Environmental Protection Agency
EPCRA - Emergency Planning and Community Right to Know Act
FDA - Food and Drug Administration
FIFRA - Federal Insecticide, Fungicide and Rodenticide Act
HCS - Hazard Communication Standard
HMIS - Hazardous Material Information System
IARC - International Agency for Research on Cancer
IRIS - Integrated Risk Information System
LD50/LC50 - Lethal Dose/Concentration kill 50%
LDLo/LCLo - Lowest Published Lethal Dose/Concentration
NAERG'96 - North American Emergency Response Guide Book (1996)
NFPA - National Fire Prevention Association
NIOSH - National Institute for Occupational Safety & Health
NPRI - National Pollutant Release Inventory
NSNR - New Substances Notification Regulations (Canada)
NTP - National Toxicology Program
OSHA - Occupational Safety & Health Administration
PEL - Permissible Exposure Limit
RCRA - Resource Conservation and Recovery Act
RTECS - Registry of Toxic Effects of Chemical Substances
SARA - Superfund Amendments and Reorganization Act
SD - Single Dose
STEL - Short Term Exposure Limit (15 minutes)
TDG - Transportation Dangerous Goods (Canada)
TDLo/TCLo - Lowest Published Toxic Dose/Concentration
TLm - Median Tolerance Limit
TLV-TWA - Threshold Limit Value-Time Weighted Average
TSCA - Toxic Substances Control Act
USEPA - United States Environmental Protection Agency
USP - United States Pharmacopoeia
WHMIS - Workplace Hazardous Material Information System

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

Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228

For Product Safety Information: (905) 804-4752

Prepared by Product Safety - JDW on 8/17/2005.

Data entry by Product Safety - JDW.

PETRO-CANADA

Material Safety Data Sheet

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing	TDG (pictograms)
	**B-3, D-2B, (D-2A)* (See Section 15)**		

Section 1. Chemical Product and Company Identification

Product Name	**JET A/A-1 AVIATION TURBINE FUEL**	**Code**	W213, SAP: 149
Synonym	Jet A-1; Jet A-1-DI; Aviation Turbine Kerosene (ATK); JP-8; NATO F-34; Jet F-34; Turbine Fuel, Aviation, Kerosene Type (CAN/CGSB-3.32)	**Validated on**	**11/8/2004.**
Manufacturer	PETRO-CANADA P.O. Box 2844 Calgary, Alberta T2P 3E3	**In case of Emergency**	Petro-Canada: 403-296-3000 Canutec Transportation: 613-996-6666 Poison Control Centre: Consult local telephone directory for emergency number(s).
Material Uses	Used as aviation turbine fuel. May contain a fuel system icing inhibitor. In the arctic, Jet A-1 may also be used as diesel fuel and heating oil.		

Section 2. Composition and Information on Ingredients

			Exposure Limits (ACGIH)		
Name	**CAS #**	**% (V/V)**	**TLV-TWA(8 h)**	**STEL**	**CEILING**
Complex misture of petroleum hydrocarbons (C9-C16)**(Kerosene) **Aromatic content is 25% maximum (benzene: nil).	8008-20-6	99.9	200 mg/m³ (***)	Not established	Not established
Fuel System Icing Inhibitor (FSII) (if added*): Diethylene Glycol Monomethyl Ether	111-77-3	≤0.15	Not established	Not established	Not established
Anti-static, antioxidant and metal deactivator additives. *Please note that Jet A-1-DI, JP-8, Jet F-34 and NATO F-34 all contain Fuel System Icing Inhibitor.	Not applicable	<0.1	Not applicable	Not applicable	Not applicable

Manufacturer Recommendation	***Application of this TLV is restricted to conditions in which there are negligible aerosol exposures.
Other Exposure Limits	Consult local, state, provincial or territory authorities for acceptable exposure limits.

Section 3. Hazards Identification.

Potential Health Effects	Combustible liquid. Exercise caution when handling this material. May cause teratogenicity/embryotoxicity. Contact with this product may cause skin irritation. Inhalation of this product may cause respiratory tract irritation and Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death. Aspiration of liquid drops into the lungs may produce potentially fatal chemical pneumonitis (fluid in the lungs), severe lung damage, or respiratory failure. For more information refer to Section 11 of this MSDS.

Section 4. First Aid Measures

Eye Contact	Quickly and gently, blot or brush away excess chemical. Immediately flush the contaminated eye(s) with lukewarm, gently flowing water for at least 20-30 minutes, by the clock, while holding the eyelid(s) open.
Skin Contact	Remove contaminated clothing - launder before reuse. Wash gently and thoroughly the contaminated skin with running water and non-abrasive soap. Seek medical attention.
Inhalation	Evacuate the victim to a safe area as soon as possible. If the victim is not breathing, perform artificial respiration. Allow the victim to rest in a well ventilated area. Seek medical attention.
Ingestion	NEVER give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing. DO NOT INDUCE VOMITING. Have victim drink 240 to 300 mL (8 to 10 oz) of water to dilute material in stomach. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration. Seek medical attention.
Note to Physician	Not available

Continued on Next Page

Section 5. Fire-fighting Measures

Flammability	Class II - combustible liquid (NFPA).	**Flammable Limits**	Lower: 0.7% Upper: 5%
Flash Points	Closed cup: >38°C (100.4°F). (Tag. Closed Cup)	**Auto-Ignition Temperature**	210°C (410°F)
Fire Hazards in Presence of Various Substances	Flammable in presence of open flames, sparks, and heat. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. This product can accumulate static charge and ignite. May accumulate in confined spaces.	**Explosion Hazards in Presence of Various Substances**	Do not cut, weld, heat, drill or pressurize empty container. Containers may explode in heat of fire.
Products of Combustion	Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), smoke and irritating vapours as products of incomplete combustion.		
Fire Fighting Media and Instructions	NAERG96, GUIDE 128, Flammable liquids (Non-polar/Water-immiscible). CAUTION: This product has a very low flash point: Use of water spray when fighting fire may be inefficient. If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also consider initial evacuation for 800 meters (1/2 mile) in all directions. SMALL FIRES: Dry chemical, CO2, water spray or regular foam. LARGE FIRES: Water spray, fog or regular foam. Do not use straight streams. Move containers from fire area if you can do it without risk. Fires Involving Tanks or Car/Trailer Loads: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting devices or any discolouration of tank. ALWAYS stay away from the ends of tanks. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible withdraw from area and let fire burn. Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection.		

Section 6. Accidental Release Measures

Material Release or Spill	IN THE EVENT OF A LARGE SPILL CONSIDER THE FOLLOWING CONTROL MEASURES: Consult current National Emergency Response Guide Book (NAERG) for appropriate spill measures if necessary. Evacuate non-essential personnel. Extinguish all ignition sources. Ventilate area. Stop leak if safe to do so. Avoid contact with spilled material. Avoid contaminating sewers, streams, rivers and other water courses with spilled material. Do not allow spilled material to enter sewer systems as vapours may accumulate and may cause an explosion/fire hazard. Ground and bond all equipment used to clean up the spilled material, as it may be a static accumulator. If spilled in a confined space, ensure appropriate confined space entry protocols are followed. Ensure clean-up personnel wear appropriate personal protective equipment. Collect used absorbent for later disposal. Use appropriate inert absorbent material to absorb spilled product. Do not use paper or other flammable materials to absorb product. Avoid breathing vapours or mists of material. Notify appropriate authorities immediately.

Section 7. Handling and Storage

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

Section 8. Exposure Controls/Personal Protection

Engineering Controls	For normal application, special ventilation is not necessary. If user's operations generate vapours or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. Make-up air should always be supplied to balance air removed by exhaust ventilation. Ensure that eyewash station and safety shower are close to work-station.
Personal Protection - ***The selection of personal protective equipment varies, depending upon conditions of use.***	
Eyes	As a minimum, safety glasses with side shields should be worn when handling this material.
Body	If this material may come into contact with the body during handling and use, we recommend wearing appropriate protective clothing to prevent contact with the skin. (Contact your PPE provider for more information).

Respiratory	A NIOSH-approved air-purifying respirator with an organic vapour cartridge or canister with a dust, fume of mist filter (R, or P series) may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. Use a positive-pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstances where air-purifying respirators may not provide adequate protection.
Hands	If this material may come in contact with the hands during handling and use, we recommend wearing gloves of the following material(s): polyvinyl alcohol (PVA) and fluoro-elastomer. Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns.
Feet	Wear appropriate footwear to prevent product from coming in contact with feet and skin.

Section 9. Physical and Chemical Properties

Physical State and Appearance	Clear liquid.	**Viscosity**	1.0-1.9 cSt @ 40ºC (104ºF)
Colour	Clear and colourless.	**Pour Point**	<-51ºC (<-60ºF)
Odour	Kerosene-like.	**Softening Point**	Not applicable.
Odour Threshold	Not available	**Dropping Point**	Not applicable.
Boiling Point	150 to 300°C (302 to 572°F)	**Penetration**	Not applicable.
Density	0.8 to 0.82 (Water = 1)	**Oil / Water Dist. Coefficient**	Not available
Vapour Density	4.5 (Air = 1)	**Ionicity (in water)**	Not available
Vapour Pressure	0.7 kPa at 20°C (5.25 mm Hg @ 68ºC)	**Dispersion Properties**	Not available
Volatility	Low than gasoline.	**Solubility**	Insoluble in water. Partially miscible in some alcohols. Miscible in other petroleum solvents.

Section 10. Stability and Reactivity

Corrosivity	Not available		
Stability	The product is stable under normal handling and storage conditions.	**Hazardous Polymerization**	Will not occur under normal working conditions.
Incompatible Substances / Conditions to Avoid	Reactive with oxidizing agents , nitric acid, chlorosulfonic acid and calcium hypochlorite.	**Decomposition Products**	May release COx, NOx, SOx, aldehydes, ketones, smoke and irritating vapours when heated to decomposition.

Section 11. Toxicological Information

Routes of Entry Skin contact, eye contact, inhalation and ingestion.

Acute Lethality

Kerosene
Acute oral toxicity (LD50): >5000 mg/kg (rat).
Acute dermal toxicity (LD50): >2000 mg/kg (rabbit).
Acute inhalation toxicity (LC50): >5000 mg/m³/4h (rat).

Diethylene Glycol Monomethyl Ether
Acute oral toxicity (LD50): 4140-5180 mg/kg (rat).
Acute dermal toxicity (LD50): >2000 mg/kg (rabbit).
Acute inhalation toxicity (LC50): >50000 mg/m³/4h (rat).

Chronic or Other Toxic Effects

Dermal Route:	This product contains a component (at >= 1%) that can cause skin irritation (Kerosene, CASRN 8008-20-6). Therefore, this product is considered to be a skin irritant.
Inhalation Route:	Inhalation of this product may cause Central Nervous System (CNS) Depression, symptoms of which may include; headache, nausea, dizziness, light-headedness and vomiting.
Oral Route:	Aspiration of liquid drops into the lungs may produce potentially fatal chemical pneumonitis (fluid in the lungs), severe lung damage, or respiratory failure.
Eye Irritation/Inflammation:	Eye contact causes irritation.
Immunotoxicity:	Not available
Skin Sensitization:	Contact with this product is not expected to cause skin sensitization, based upon the available data and the known hazards of the components.
Respiratory Tract Sensitization:	Contact with this product is not expected to cause respiratory tract sensitization, based upon the available data and the known hazards of the components.

Mutagenic:	This product is not known to contain any components at >= 0.1% that have been shown to cause mutagenicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a mutagen.
Reproductive Toxicity:	This product is not known to contain any components at >= 0.1% that have been shown to cause reproductive toxicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a reproductive toxin.
Teratogenicity/Embryotoxicity:	This product contains a component(s) at >= 0.1% that has been shown to cause teratogenicity and/or embryotoxicity in laboratory tests (Diethylene Glycol Monomethyl Ether, CASRN 111-77-3). Therefore, this product is considered to be a teratogen/embryotoxin.
Carcinogenicity (ACGIH):	ACGIH A3: Confirmed animal carcinogen with unknown relevance to human (Kerosene, CASRN 8008-20-6)
Carcinogenicity (IARC):	IARC Group 3: Not classifiable as a human carcinogen (Kerosene, CASRN 8008-20-6).
Carcinogenicity (NTP):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by NTP.
Carcinogenicity (IRIS):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by IRIS.
Carcinogenicity (OSHA):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by OSHA.
Other Considerations	Chronic exposure to some of the hazardous components of this product may result in damage to the following organs and/or systems: kidney.

Section 12. Ecological Information

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

Section 13. Disposal Considerations

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

Section 14. Transport Information

TDG Classification	FUEL, AVIATION, TURBINE ENGINE, 3, UN1863, PGII (CL-TDG)	**Special Provisions for Transport**	See Transportation of Dangerous Goods Regulations.

Section 15. Regulatory Information

Other Regulations

This product is acceptable for use under the provisions of WHMIS-CPR. All components of this formulation are listed on the CEPA-DSL (Domestic Substances List).

The WHMIS classification of Jet A/A-1 is B3, D2B.
The WHMIS classification of Jet A/A-1-DI, JP-8, Jet F-34 and NATO F-34, which all contain FSII (Diethylene Glycol Monomethyl Ether), is B3, D2A, D2B.

All components of this formulation are listed on the US EPA-TSCA Inventory.

All components of this product are on the European Inventory of Existing Commercial Chemical Substances (EINECS).

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

Please contact Product Safety for more information.

DSD/DPD (Europe)	Not evaluated.	**HCS (U.S.A.)**	CLASS: Combustible liquid having a flash point between 37.8ºC (100ºF) and 93.3ºC (200ºF). CLASS: Irritating material. Target Organ Effects* (Only applies to: Jet A/A-1-D1, JP8, Jet F-34 and NATO F-34)

ADR (Europe) (Pictograms) NOT EVALUATED FOR EUROPEAN TRANSPORT

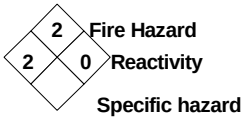
NON ÉVALUÉ POUR LE TRANSPORT EUROPÉEN.

DOT (U.S.A) (Pictograms)

HMIS (U.S.A.)

Health Hazard	2/2*
Fire Hazard	2
Reactivity	0
Personal Protection	H

NFPA (U.S.A.)



Rating
0 Insignificant
1 Slight
2 Moderate
3 High
4 Extreme

Section 16. Other Information

References Available upon request.

* Marque de commerce de Petro-Canada - Trademark

Glossary

ACGIH - American Conference of Governmental Industrial Hygienists
ADR - Agreement on Dangerous goods by Road (Europe)
ASTM - American Society for Testing and Materials
BOD5 - Biological Oxygen Demand in 5 days
CAN/CGA B149.2 Propane Installation Code
CAS - Chemical Abstract Services
CEPA - Canadian Environmental Protection Act
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CFR - Code of Federal Regulations
CHIP - Chemicals Hazard Information and Packaging Approved Supply List
CNS - Central Nervous System
COD5 - Chemical Oxygen Demand in 5 days
CPR - Controlled Products Regulations
DOT - Department of Transport
DSCL - Dangerous Substances Classification and Labeling (Europe)
DSD/DPD - Dangerous Substances or Dangerous Preparations Directives (Europe)
DSL - Domestic Substance List
EEC/EU - European Economic Community/European Union
EINECS - European Inventory of Existing Commercial Chemical Substances
EPA - Environmental Protection Agency
EPCRA - Emergency Planning and Community Right to Know Act
FDA - Food and Drug Administration
FIFRA - Federal Insecticide, Fungicide and Rodenticide Act
HCS - Hazard Communication Standard
HMIS - Hazardous Material Information System
IARC - International Agency for Research on Cancer
IRIS - Integrated Risk Information System
LD50/LC50 - Lethal Dose/Concentration kill 50%
LDLo/LCLo - Lowest Published Lethal Dose/Concentration
NAERG'96 - North American Emergency Response Guide Book (1996)
NFPA - National Fire Prevention Association
NIOSH - National Institute for Occupational Safety & Health
NPRI - National Pollutant Release Inventory
NSNR - New Substances Notification Regulations (Canada)
NTP - National Toxicology Program
OSHA - Occupational Safety & Health Administration
PEL - Permissible Exposure Limit
RCRA - Resource Conservation and Recovery Act
RTECS - Registry of Toxic Effects of Chemical Substances
SARA - Superfund Amendments and Reorganization Act
SD - Single Dose
STEL - Short Term Exposure Limit (15 minutes)
TDG - Transportation Dangerous Goods (Canada)
TDLo/TCLo - Lowest Published Toxic Dose/Concentration
TLm - Median Tolerance Limit
TLV-TWA - Threshold Limit Value-Time Weighted Average
TSCA - Toxic Substances Control Act
USEPA - United States Environmental Protection Agency
USP - United States Pharmacopoeia
WHMIS - Workplace Hazardous Material Information System

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

Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228

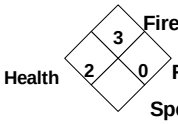
For Product Safety Information: (905) 804-4752

Prepared by Product Safety - TLM on 11/8/2004.

Data entry by Product Safety - RS.

PETRO-CANADA

Material Safety Data Sheet

NFPA	HMIS (U.S.A.)	Rating	Protective Clothing	DOT (pictograms)
	Health Hazard 2* Fire Hazard 3 Reactivity 0 Personal Protection H	0 Insignificant 1 Slight 2 Moderate 3 High 4 Extreme		

Section I. Chemical Product and Company Identification

Product Name	**JET B AVIATION TURBINE FUEL**	**Code**	W219 SAP: 150, 151, 152
		DSL	See Section 15
Synonym	Jet B; Jet B DI; JP-4; Jet F-40; NATO F-40; Turbine Fuel, Aviation, Wide Cut Type (CAN/CGSB-3.22).	**TSCA**	See Section 15
Manufacturer	PETRO-CANADA P.O. Box 2844 Calgary, Alberta T2P 3E3	**In case of Emergency**	Petro-Canada: 403-296-3000 Canutec Transportation: 613-996-6666 Poison Control Centre: Consult local telephone directory for emergency number(s).
Material Uses	Used as aviation turbine fuel. May contain a fuel system icing inhibitor.		

Section II. Composition and Information on Ingredients

			Exposure Limits (ACGIH)		
Name	**CAS #**	**% (W/W)**	**TLV-TWA(8 h)**	**STEL**	**CEILING**
Complex mixture of petroleum hydrocarbons (C6-C14).	64741-41-9	>99	Not established	Not established	Not established
Benzene	71-43-2	<0.5	0.5 ppm	2.5 ppm	Not established
Fuel System Icing Inhibitor (FSII) (if added*): Diethylene Glycol Monomethyl Ether	111-77-3	≤0.15	Not established	Not established	Not established
Anti-static, antioxidant, corrosion inhibitor and metal deactivator additives. * Please note that Jet B DI, JP-4, Jet F-40 and NATO F-40 all contain Fuel System Icing Inhibitor (FSII).corrosion inhibitor	Not applicable	<0.1	Not applicable	Not applicable	Not applicable

Manufacturer Recommendation	Not applicable
Other Exposure Limits	Consult local, state, provincial or territory authorities for acceptable exposure limits.

Section III. Hazards Identification.

Potential Health Effects	Flammable liquid. Exercise caution when handling this material. Skin and eye contact can cause irritation. Inhalation of vapours can cause irritation of the respiratory tract and CNS depression with symptoms of nausea, headaches, vomiting, dizziness, fatigue, light-headedness, reduced coordination, unconciousness and possibly death. Aspiration into the lungs may produce potentially fatal chemical pneumonitis (fluid in the lungs), severe lung damage, or respiratory failure. May cause cancer. May cause teratogenicity/embryotoxicity. For more information refer to Section 11 of this MSDS.

Section IV. First Aid Measures

Eye Contact	Quickly and gently blot or brush away chemical. Immediately flush the contaminated eye(s) with lukewarm, gently flowing water for 20 minutes or until the chemical is removed, while holding the eyelid(s) open. Take care not to rinse contaminated water into the unaffected eye or onto the face. Obtain medical attention immediately.
Skin Contact	Quickly and gently, blot or brush away excess chemical. Wash gently and thoroughly with warm water and non-abrasive soap for 5 minutes or until chemical is removed.
Inhalation	Take proper precautions to ensure your own safety before attempting rescue (e.g. wear appropriate protective equipment). Remove source of contamination or move victim to fresh air. If breathing is difficult, oxygen may be beneficial if administered by trained personnel, preferably on a doctor's advice. DO NOT allow victim to move about unnecessarily. Immediately transport victim to an emergency care facility.

Continued on Next Page

Ingestion	NEVER give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing. Have victim rinse mouth thoroughly with water. DO NOT INDUCE VOMITING. Have victim drink 240 to 300 mL (8 to 10 oz) of water to dilute material in stomach. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration. Repeat administration of water.
Note to Physician	Not available

Section V. Fire-fighting Measures

Flammability	Flammable liquid (NFPA).	**Flammable Limits**	LOWER: 1.3% UPPER: 8% (NFPA)
Flash Points	CLOSED CUP: -31ºC (-24°F) (NFPA)	**Auto-Ignition Temperature**	240°C (464°F) (NFPA)
Fire Hazards in Presence of Various Substances	Flammable in presence of open flames, sparks, and heat. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. This product can accumulate static charge and ignite. May accumulate in confined spaces.	**Explosion Hazards in Presence of Various Substances**	Do not cut, weld, heat, drill or pressurize empty container. Containers may explode in heat of fire.
Products of Combustion	Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), aldehydes, ketones, smoke and irritating vapours as products of incomplete combustion.		
Fire Fighting Media and Instructions	NAERG96, GUIDE 128, Flammable liquids (Non-polar/Water-immiscible). CAUTION: This product has a very low flash point: Use of water spray when fighting fire may be inefficient. If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also consider initial evacuation for 800 meters (1/2 mile) in all directions. SMALL FIRES: Dry chemical, CO2, water spray or regular foam. LARGE FIRES: Water spray, fog or regular foam. Do not use straight streams. Move containers from fire area if you can do it without risk. Fires Involving Tanks or Car/Trailer Loads: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting devices or any discolouration of tank. ALWAYS stay away from the ends of tanks. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible withdraw from area and let fire burn. Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection.		

Section VI. Accidental Release Measures

Material Release or Spill	IN THE EVENT OF A LARGE SPILL CONSIDER THE FOLLOWING CONTROL MEASURES: Consult current National Emergency Response Guide Book (NAERG) for appropriate spill measures if necessary. Evacuate non-essential personnel. Extinguish all ignition sources. Ventilate area. Stop leak if safe to do so. Avoid contact with spilled material. Do not allow spilled material to enter sewer systems as vapours may accumulate and may cause an explosion/fire hazard. If spilled in a confined space, ensure appropriate confined space entry protocols are followed. Ensure clean-up personnel wear appropriate personal protective equipment. Use appropriate inert absorbent material to absorb spilled product. Do not use paper or other flammable materials to absorb product. Collect used absorbent for later disposal. Avoid breathing vapours or mists of material. Notify appropriate authorities immediately.

Section VII. Handling and Storage

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

Section VIII. Exposure Controls/Personal Protection

Engineering Controls	For normal application, special ventilation is not necessary. If user's operations generate vapours or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. Make-up air should always be supplied to balance air removed by exhaust ventilation. Ensure that eyewash station and safety shower are close to work-station.

Personal Protection - ***The selection of personal protective equipment varies, depending upon conditions of use.***

Eyes	As a minimum, safety glasses with side shields should be worn when handling this material.
Body	If this material may come into contact with the body during handling and use, we recommend wearing appropriate protective clothing to prevent contact with the skin. (Contact your PPE provider for more information).
Respiratory	A NIOSH-approved air-purifying respirator with an organic vapour cartridge or canister with a dust, fume of mist filter (R, or P series) may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. Use a positive-pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstances where air-purifying respirators may not provide adequate protection.
Hands	If this material may come in contact with the hands during handling and use, we recommend wearing gloves of the following material(s): neoprene, polyvinyl alcohol (PVA), and fluoro-elastomer. Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns.
Feet	Wear appropriate footwear to prevent product from coming in contact with feet and skin.

Section IX. Physical and Chemical Properties

Physical State and Appearance	Clear liquid.	**Viscosity**	Not available (similar to gasoline)
Colour	Clear and colourless.	**Pour Point**	Freezing Point: <-51ºC (<-60ºF) for Jet B/Jet B DI; <-58ºC (<-72ºF) for Jet Fuel F-40.
Odour	Gasoline like.	**Softening Point**	Not applicable.
Odour Threshold	Not available	**Dropping Point**	Not applicable.
Boiling Point	50 to 270°C (122 to 518°F)	**Penetration**	Not applicable.
Density	0.75 to 0.80 kg/L @ 15ºC (59ºF).	**Oil / Water Dist. Coeff.**	Not available
Vapour Density	3.5 (Air = 1)	**Ionicity (in water)**	Not available
Vapour Pressure	21 kPa (158 mmHg) @ 37.8ºC (100ºF).	**Dispersion Properties**	Not available
Volatility	Volatile.	**Solubility**	Insoluble in water. Partially miscible in some alcohols. Miscible in other petroleum solvents.

Section X. Stability and Reactivity

Corrosivity	Not available		
Stability	The product is stable under normal handling and storage conditions.	**Hazardous Polymerization**	Will not occur under normal working conditions.
Incompatible Substances / Conditions to Avoid	Can react with strong oxidizing agents, uranium hexafluoride, diborane. Incompatible with halogens and halogen compounds.	**Decomposition Products**	May release COx, NOx, SOx, aldehydes, ketones, smoke and irritating vapours when heated to decomposition.

Section XI. Toxicological Information

Routes of Entry	Skin contact, eye contact, inhalation and ingestion.
Acute Lethality	Acute toxicity information is not available for the product as a whole, therefore, data for some of the ingredients is provided below:

Based on toxicity of similar product.
Acute oral toxicity (LD50): >5000 mg/kg (rat).
Acute dermal toxicity (LD50): >5000 mg/kg (rabbit).
Acute inhalation toxicity (LC50): >5000 mg/m³/4h (rat).

Benzene
Acute oral toxicity (LD50): 930 mg/kg (rat).
Acute dermal toxicity (LD50): >9400 mg/kg (rabbit).

Acute inhalation toxicity (LC50): 13200 ppm/4h (rat).

Diethylene Glycol Monomethyl Ether
Acute oral toxicity (LD50): 4140-5180 mg/kg (rat).
Acute dermal toxicity (LD50): >2000 mg/kg (rabbit).
Acute inhalation toxicity (LC50): >50000 mg/m³/4h (rat).

Chronic or Other Toxic Effects

Dermal Route:	Skin contact can cause irritation. Prolonged or repeated contact may defat and dry skin, and cause dermatitis.
Inhalation Route:	Ingestion of this product may cause Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.
Oral Route:	Ingestion of this product may lead to aspiration of the liquid, especially if vomiting occurs. This may result in chemical pneumonitis (inflammation of the lungs) and/or pulmonary edema (an accumulation of fluid in the lungs).
Eye Irritation/Inflammation:	Short-term exposure is expected to cause only slight irritation, if any.
Immunotoxicity:	Not available
Skin Sensitization:	Contact with this product is not expected to cause skin sensitization, based upon the available data and the known hazards of the components.
Respiratory Tract Sensitization:	Contact with this product is not expected to cause respiratory tract sensitization, based upon the available data and the known hazards of the components.
Mutagenic:	Benzene is tumorigenic by RTECS criteria.
Reproductive Toxicity:	This product is not known to contain any components at >= 0.1% that have been shown to cause reproductive toxicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a reproductive toxin.
Teratogenicity/Embryotoxicity:	This product contains a component(s) at >= 0.1% that has been shown to cause teratogenicity and/or embryotoxicity in laboratory tests. Therefore, this product is considered to be a teratogen/embryotoxin [Diethylene Glycol Monomethyl Ether].
Carcinogenicity (ACGIH):	ACGIH A1: confirmed human carcinogen. [Benzene]
Carcinogenicity (IARC):	IARC Group 1: carcinogenic to Humans. [Benzene]
Carcinogenicity (NTP):	NTP Group 1: known to be a carcinogen. [Benzene]
Carcinogenicity (IRIS):	EPA/IRIS Class A: human carcinogen.
Carcinogenicity (OSHA):	Benzene is an OSHA known carcinogen.
Other Considerations	No additional remark.

Section XII. Ecological Information

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

Section XIII. Disposal Considerations

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

Section XIV. Transport Information

DOT Classification	Fuel, aviation, turbine engine; UN 1863, 3, PG II	**Special Provisions for Transport**	Not applicable.

Section XV. Regulatory Information

Other Regulations	This product is acceptable for use under the provisions of WHMIS-CPR. All components of this formulation are listed on the CEPA-DSL (Domestic Substances List). All components of this formulation are listed on the US EPA-TSCA Inventory. All components of this product are on the European Inventory of Existing Commercial Chemical Substances (EINECS). This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations

(CPR) and the MSDS contains all of the information required by the CPR.

Please contact Product Safety for more information.

DSD/DPD (EEC)	Not evaluated.	**WHMIS (Canada)**	B-2, D-2A, D-2B
ADR (Europe) (Pictograms)	**NOT EVALUATED FOR EUROPEAN TRANSPORT** **NON ÉVALUÉ POUR LE TRANSPORT EUROPÉEN.**	**TDG (Canada) (Pictograms)**	

Section XVI. Other Information

References Available upon request.
* Marque de commerce de Petro-Canada - Trademark

Glossary

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ADR - Agreement on Dangerous goods by Road (Europe)
ASTM - American Society for Testing and Materials
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LDLo/LCLo - Lowest Published Lethal Dose/Concentration
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TSCA - Toxic Substances Control Act
USEPA - United States Environmental Protection Agency
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WHMIS - Workplace Hazardous Material Information System

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

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

For Product Safety Information: (905) 804-4752

Prepared by Product Safety - JDW on 2/8/2005.

Data entry by Product Safety - JDW.

PETRO-CANADA

Material Safety Data Sheet

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing	TDG (pictograms)
	**B-2, D-2A, D-2B**		

Section 1. Chemical Product and Company Identification

Product Name	**GASOLINE, UNLEADED**	**Code**	W102E
		Validated on	**7/4/2005.**
Synonym	Regular, Unleaded Gasoline (US Grade), Mid-Grade, Plus, Super, WinterGas, SummerGas, Supreme, SuperClean WinterGas, RegularClean, PlusClean, Premium, marked or dyed gasoline, Super Premium (94 RO)		
Manufacturer	PETRO-CANADA P.O. Box 2844 Calgary, Alberta T2P 3E3	**In case of Emergency**	Petro-Canada: 403-296-3000 Canutec Transportation: 613-996-6666 Poison Control Centre: Consult local telephone directory for emergency number(s).
Material Uses	Unleaded gasoline is used in spark ignition engines including motor vehicles, inboard and outboard boat engines, small engines such as chain saws and lawn mowers, and recreational vehicles.		

Section 2. Composition and Information on Ingredients

			Exposure Limits (ACGIH)		
Name	**CAS #**	**% (W/W)**	**TLV-TWA(8 h)**	**STEL**	**CEILING**
Gasoline	8006-61-9	85-100	300 ppm	500 ppm	Not established
Methyl tert-butyl ether	1634-04-4	0-15	50 ppm	Not established	Not established
Benzene	71-43-2	<1.5	0.5 ppm	2.5 ppm	Not established
Note: Petro-Canada does not use MTBE in the manufacturing of its gasoline, however MTBE can be introduced from time to time through the use of external gasoline blendstocks.					

Manufacturer Recommendation	Not applicable
Other Exposure Limits	Consult local, state, provincial or territory authorities for acceptable exposure limits.

Section 3. Hazards Identification.

Potential Health Effects	Flammable liquid. Exercise caution when handling this material. May cause cancer. May cause heritable genetic effects (mutagenicity). This product contains an ingredient or ingredients, which have been shown to cause chronic toxic effects. Contact with this product may cause skin and eye irritation. Inhalation of this product may cause respiratory tract irritation and Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death. Ingestion of this product may cause gastro-intestinal irritation. Aspiration of this product may result in severe irritation or burns to the respiratory tract. For more information refer to Section 11 of this MSDS.

Section 4. First Aid Measures

Eye Contact	Avoid direct contact. Quickly and gently blot or brush away chemical. Immediately flush the contaminated eye(s) with lukewarm, gently flowing water for 20 minutes or until the chemical is removed, while holding the eyelid(s) open. Take care not to rinse contaminated water into the unaffected eye or onto the face. Obtain medical attention immediately.
Skin Contact	Avoid direct contact. Wear chemical resistant protective clothing if necessary. Quickly and gently, blot or brush away excess chemical. Wash gently and thoroughly with warm water and non-abrasive soap for 20 minutes or until chemical is removed. Under running water, remove contaminated clothing, shoes and leather goods (e.g., watch bands, belts, etc.). Obtain medical attention immediately. Completely decontaminate clothing, shoes and leather goods before reuse or discard.

Continued on Next Page

Inhalation	Take proper precautions to ensure your own safety before attempting rescue (e.g. wear appropriate protective equipment). If breathing has stopped, trained personnel should begin artificial respiration (AR) or, if the heart has stopped, cardiopulmonary resuscitation (CPR) immediately. Immediately transport victim to an emergency care facility.
Ingestion	NEVER give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing. Have victim rinse mouth thoroughly with water. DO NOT INDUCE VOMITING. Have victim drink 240 to 300 mL (8 to 10 oz) of water to dilute material in stomach. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration. Repeat administration of water. If breathing has stopped, trained personnel should begin artificial respiration (AR) or, if the heart has stopped, cardiopulmonary resuscitation (CPR) immediately. Quickly transport victim to an emergency care facility.
Note to Physician	Not available

Section 5. Fire-fighting Measures

Flammability	Flammable liquid (NFPA).	**Flammable Limits**	Lower: 1.3%; Upper: 7.6% (NFPA).
Flash Points	Closed Cup: -50 to -38°C (-58 to -36°F), ASTM D56 Standard Test Method for Flash Point by Tag Closed Tester.	**Auto-Ignition Temperature**	257°C (495°F) (NFPA).
Fire Hazards in Presence of Various Substances	Extremely flammable in presence of open flames, sparks, and heat. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. Rapid escape of vapour may generate static charge causing ignition. May accumulate in confined spaces.	**Explosion Hazards in Presence of Various Substances**	Do not cut, weld, heat, drill or pressurize empty container. Containers may explode in heat of fire. Vapours may form explosive mixtures with air.
Products of Combustion	Carbon oxides (CO, CO2), nitrogen oxides (NOx), polynuclear aromatic hydrocarbons, phenols, smoke and irritating vapours as products of incomplete combustion. See Section 11 (Other Considerations) for information regarding the toxicity of the combustion products.		
Fire Fighting Media and Instructions	NAERG2004 GUIDE 128, Flammable liquids (Non-polar/Water-immiscible). CAUTION: This product has a very low flash point: Use of water spray when fighting fire may be inefficient. If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also consider initial evacuation for 800 meters (1/2 mile) in all directions. SMALL FIRES: Dry chemical, CO2, water spray or regular foam. LARGE FIRES: Water spray, fog or regular foam. Do not use straight streams. Move containers from fire area if you can do it without risk. Fires Involving Tanks or Car/Trailer Loads: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting devices or any discolouration of tank. ALWAYS stay away from the ends of tanks. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible withdraw from area and let fire burn. Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection.		

Section 6. Accidental Release Measures

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

Section 7. Handling and Storage

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

Section 8. Exposure Controls/Personal Protection

Engineering Controls	For normal application, special ventilation is not necessary. If user's operations generate vapours or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. Make-up air should always be supplied to balance air removed by exhaust ventilation. Ensure that eyewash station and safety shower are close to work-station.

Personal Protection - *The selection of personal protective equipment varies, depending upon conditions of use.*

Eyes	As a minimum, safety glasses with side shields should be worn when handling this material.
Body	If this material may come in contact with the body during handling and use, we recommend wearing appropriate protective clothing to prevent contact with the skin. (Contact your PPE provider for more information.)
Respiratory	A NIOSH-approved air-purifying respirator with an organic vapour cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. Use a positive-pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstances where air-purifying respirators may not provide adequate protection.
Hands	If this material may come in contact with the hands during handling and use, we recommend wearing gloves of the following material(s): polyvinyl alcohol (PVA), fluoro-elastomer. Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns.
Feet	Wear appropriate footwear to prevent product from coming in contact with feet and skin.

Section 9. Physical and Chemical Properties

Physical State and Appearance	Clear liquid.	**Viscosity**	Not available
Colour	Clear to slightly yellow, undyed liquid. May be dyed red for taxation purposes.	**Pour Point**	Not applicable.
Odour	Gasoline. MTBE has a terpene-like odour.	**Softening Point**	Not applicable.
Odour Threshold	Less than 1 ppm.	**Dropping Point**	Not applicable.
Boiling Point	25 to 220°C (77 to 428°F) Initial boiling point by ASTM D86 Standard Test Method.	**Penetration**	Not applicable.
Density	0.685 - 0.80 kg/L @ 15°C (59°F).	**Oil / Water Dist. Coefficient**	Not available
Vapour Density	3 to 4 (Air = 1) (NFPA).	**Ionicity (in water)**	Not available
Vapour Pressure	<107 kPa @ 37.8ºC (100ºF)	**Dispersion Properties**	Not available
Volatility	Volatile.	**Solubility**	Hydrocarbon components virtually insoluble in water. Soluble in alcohol, ether, chloroform, and benzene. Dissolves fats, oils and natural resins.

Section 10. Stability and Reactivity

Corrosivity	Non corrosive.		
Stability	The product is stable under normal handling and storage conditions.	**Hazardous Polymerization**	Will not occur under normal working conditions.
Incompatible Substances / Conditions to Avoid	Reactive with oxidizing agents, acids, interhalogens and uranium hexafluoride.	**Decomposition Products**	May release COx, NOx, phenols, polynuclear aromatic hydrocarbons, acrid smoke and irritating vapours when heated to decomposition.

Section 11. Toxicological Information

Routes of Entry	Skin contact, eye contact, inhalation, and ingestion.
Acute Lethality	Gasoline (8006-61-9): Acute Oral toxicity (LD50): 13600 mg/kg (rat) Acute Dermal toxicity (LD50): >5000 mg/kg (rabbit) MTBE (1634-04-4): Acute Oral toxicity (LD50): 2963 mg/kg (rat) Acute Dermal toxicity (LD50): >6800 mg/kg (rabbit) Acute Inhalation toxicity (LC50): 23576 ppm/4h (rat)

	Benzene (71-43-2): Acute Oral toxicity (LD50): 930 mg/kg (rat) Acute Dermal toxicity (LD50): >9400 mg/kg (rabbit) Acute Inhalation toxicity (LC50): 13229 ppm/4h (rat)
Chronic or Other Toxic Effects	
Dermal Route:	Contact may cause skin irritation. Prolonged or repeated contact may defat and dry skin, and cause dermatitis.
Inhalation Route:	Inhalation of this product may cause respiratory tract irritation. Inhalation of this product may cause Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.
Oral Route:	Ingestion of this product may cause gastro-intestinal irritation. Aspiration of this product may result in severe irritation or burns to the respiratory tract. Ingestion of this product may cause Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.
Eye Irritation/Inflammation:	Contact may cause eye irritation.
Immunotoxicity:	Not available
Skin Sensitization:	Contact with this product is not expected to cause skin sensitization, based upon the available data and the known hazards of the components.
Respiratory Tract Sensitization:	Contact with this product is not expected to cause respiratory tract sensitization, based upon the available data and the known hazards of the components.
Mutagenic:	This product contains a component(s) at >= 0.1% that has been shown to cause mutagenicity in laboratory tests. Therefore, this product is considered to be a mutagen. (Benzene)
Reproductive Toxicity:	This product is not known to contain any components at >= 0.1% that have been shown to cause reproductive toxicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a reproductive toxin.
Teratogenicity/Embryotoxicity:	This product is not known to contain any components at >= 0.1% that have been shown to cause teratogenicity and/or embryotoxicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a teratogen/embryotoxin.
Carcinogenicity (ACGIH):	This product contains the following chemical(s) at >=0.1% that are listed as carcinogenic compounds. Therefore this product is considered to be carcinogenic. [Considered to be A1 by the ACGIH. Benzene (71-43-2)] [Considered to be A3 by the ACGIH. Gasoline (8006-61-9), MTBE (1634-04-4)]
Carcinogenicity (IARC):	This product contains the following chemical(s) at >=0.1% that are listed as carcinogenic compounds. Therefore this product is considered to be carcinogenic. [Considered to be carcinogenic to humans (group 1) by IARC. Benzene (71-43-2)] [Considered to be carcinogenic to humans (group 2B) by IARC. Gasoline (8006-61-9)]
Carcinogenicity (NTP):	This product contains the following chemical(s) at >=0.1% that are listed as carcinogenic compounds. Therefore this product is considered to be carcinogenic. [Known to be a human carcinogen according to NTP. Benzene (71-43-2)]
Carcinogenicity (IRIS):	This product contains the following chemical(s) at >=0.1% that are listed as carcinogenic compounds. Therefore this product is considered to be carcinogenic. [Considered to be carcinogenic by IRIS. Benzene (71-43-2)]
Carcinogenicity (OSHA):	This product contains the following chemical(s) at >=0.1% that are listed as carcinogenic compounds. Therefore this product is considered to be carcinogenic. [Considered to be carcinogenic by OSHA. Benzene (71-43-2)]
Other Considerations	Gasoline engine exhaust is possibly carcinogenic to humans (IARC Group 2B).

Section 12. Ecological Information

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

Section 13. Disposal Considerations

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

Section 14. Transport Information

TDG Classification GASOLINE, 3, UN1203, PGII (CL-TDG)

Special Provisions for Transport See Transportation of Dangerous Goods Regulations.

Section 15. Regulatory Information

Other Regulations This product is acceptable for use under the provisions of WHMIS-CPR. All components of this formulation are listed on the CEPA-DSL (Domestic Substances List).

All components of this formulation are listed on the US EPA-TSCA Inventory.

All components of this product are on the European Inventory of Existing Commercial Chemical Substances (EINECS).

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

Please contact Product Safety for more information.

DSD/DPD (Europe) Not evaluated.

HCS (U.S.A.) CLASS: Contains material which may cause cancer.
CLASS: Flammable liquid having a flash point lower than 37.8°C (100°F).
CLASS: Irritating substance.
CLASS: Target organ effects.

ADR (Europe) (Pictograms) NOT EVALUATED FOR EUROPEAN TRANSPORT

NON ÉVALUÉ POUR LE TRANSPORT EUROPÉEN.

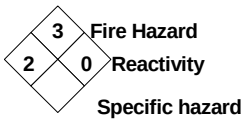
DOT (U.S.A) (Pictograms) Not evaluated for transport

Non évalué pour le transport

HMIS (U.S.A.)

Health Hazard	2*
Fire Hazard	3
Reactivity	0
Personal Protection	H

NFPA (U.S.A.)



Rating
0 Insignificant
1 Slight
2 Moderate
3 High
4 Extreme

Section 16. Other Information

References Available upon request.
* Marque de commerce de Petro-Canada - Trademark

Glossary

ACGIH - American Conference of Governmental Industrial Hygienists
ADR - Agreement on Dangerous goods by Road (Europe)
ASTM - American Society for Testing and Materials
BOD5 - Biological Oxygen Demand in 5 days
CAN/CGA B149.2 Propane Installation Code
CAS - Chemical Abstract Services
CEPA - Canadian Environmental Protection Act
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CFR - Code of Federal Regulations
CHIP - Chemicals Hazard Information and Packaging Approved Supply List
CNS - Central Nervous System
COD5 - Chemical Oxygen Demand in 5 days
CPR - Controlled Products Regulations
DOT - Department of Transport
DSCL - Dangerous Substances Classification and Labeling (Europe)
DSD/DPD - Dangerous Substances or Dangerous Preparations Directives (Europe)
DSL - Domestic Substance List
EEC/EU - European Economic Community/European Union
EINECS - European Inventory of Existing Commercial Chemical Substances
EPA - Environmental Protection Agency
EPCRA - Emergency Planning and Community Right to Know Act
FDA - Food and Drug Administration
FIFRA - Federal Insecticide, Fungicide and Rodenticide Act
HCS - Hazard Communication Standard
HMIS - Hazardous Material Information System
IRIS - Integrated Risk Information System
LD50/LC50 - Lethal Dose/Concentration kill 50%
LDLo/LCLo - Lowest Published Lethal Dose/Concentration
NAERG'96 - North American Emergency Response Guide Book (1996)
NFPA - National Fire Prevention Association
NIOSH - National Institute for Occupational Safety & Health
NPRI - National Pollutant Release Inventory
NSNR - New Substances Notification Regulations (Canada)
NTP - National Toxicology Program
OSHA - Occupational Safety & Health Administration
PEL - Permissible Exposure Limit
RCRA - Resource Conservation and Recovery Act
RTECS - Registry of Toxic Effects of Chemical Substances
SARA - Superfund Amendments and Reorganization Act
SD - Single Dose
STEL - Short Term Exposure Limit (15 minutes)
TDG - Transportation Dangerous Goods (Canada)
TDLo/TCLo - Lowest Published Toxic Dose/Concentration
TLm - Median Tolerance Limit
TLV-TWA - Threshold Limit Value-Time Weighted Average
TSCA - Toxic Substances Control Act
USEPA - United States Environmental Protection Agency
USP - United States Pharmacopoeia
WHMIS - Workplace Hazardous Material Information System

IARC - International Agency for Research on Cancer

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

Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228

For Product Safety Information: (905) 804-4752

Prepared by Product Safety - JDW on 7/4/2005.

Data entry by Product Safety - JDW.

PETRO-CANADA

Material Safety Data Sheet

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing	TDG (pictograms)
	**Not controlled**		

Section 1. Chemical Product and Company Identification

Product Name	**RALUBE 40 CF, 1740 CF**	**Code**	RL40CF, 490-777-0 RL174CF, 490-778-0
Synonym	Not available	**Validated on**	**3/24/2003.**
Manufacturer	PETRO-CANADA P.O. Box 2844 Calgary, Alberta T2P 3E3	**In case of Emergency**	Petro-Canada: 403-296-3000 Canutec Transportation: 613-996-6666 Poison Control Centre: Consult local telephone directory for emergency number(s).
Material Uses	This product is an oil for use in railroad locomotive diesel engines.		

Section 2. Composition and Information on Ingredients

			Exposure Limits (ACGIH)		
Name	**CAS #**	**% (V/V)**	**TLV-TWA(8 h)**	**STEL**	**CEILING**
1) Mixture of severely hydrotreated and hydrocracked, and/or solvent-refined base oil (petroleum) and other proprietary, non-hazardous additives.	Mixture	100	5 mg/m³ (oil mist)	10 mg/m³ (oil mist)	Not established

Manufacturer Recommendation	Not applicable
Other Exposure Limits	Consult local, state, provincial or territory authorities for acceptable exposure limits.

Section 3. Hazards Identification.

Potential Health Effects	Non irritating to slight transient irritation to skin and eyes, but no permanent damage. Relatively non-toxic via ingestion. This product has a low vapour pressure and is not expected to present an inhalation exposure at ambient conditions. Upon heating to high temperatures, or mechanical actions which may produce vapours or mists, inhalation of product may cause irritation of the breathing passages. For more information, refer to Section 11.

Section 4. First Aid Measures

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

Section 5. Fire-fighting Measures

Flammability	May be combustible at high temperature.	**Flammable Limits**	Not available
Flash Points	OPEN CUP: 257°C (494.6°F) (Cleveland)	**Auto-Ignition Temperature**	Fire Point: 270°C (518°F)
Fire Hazards in Presence of Various Substances	Low fire hazard. This material must be heated before ignition will occur.	**Explosion Hazards in Presence of Various Substances**	Do not cut, weld, heat, drill or pressurize empty container. Containers may explode in heat of fire.
Products of Combustion	Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), CaOx, MoOx, smoke and irritating vapours as products of incomplete combustion.		

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Available in French

Fire Fighting Media and Instructions	NAERG96, GUIDE 171, Substances (low to moderate hazard). If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (0.5 mile) in all directions; also, consider initial evacuation for 800 meters (0.5 mile) in all directions. Shut off fuel to fire if it is possible to do so without hazard. If this is impossible, withdraw from area and let fire burn out under controlled conditions. Withdraw immediately in case of rising sound from venting safety device or any discolouration of tank due to fire. Cool containing vessels with water spray in order to prevent pressure build-up, autoignition or explosion. SMALL FIRE: use DRY chemicals, foam, water spray or CO2. LARGE FIRE: use water spray, fog or foam. For small outdoor fires, portable fire extinguishers may be used, and self contained breathing apparatus (SCBA) may not be required. For all indoor fires and any significant outdoor fires, SCBA is required. Respiratory and eye protection are required for fire fighting personnel.

Section 6. Accidental Release Measures

Material Release or Spill	Consult current National Emergency Response Guide Book (NAERG) for appropriate spill measures if necessary. Extinguish all ignition sources. Stop leak if safe to do so. Avoid contact with spilled material. Dike spilled material. Do not use paper or other flammable materials to absorb product. Use appropriate inert absorbent material to absorb spilled product. Collect used absorbent for later disposal. Avoid contaminating sewers, streams, rivers and other water courses with spilled material. Notify appropriate authorities immediately.

Section 7. Handling and Storage

Handling	Avoid contact with any sources of ignition, flames, heat, and sparks. Avoid skin contact. Avoid eye contact. Avoid inhalation of product vapours or mists. Empty containers may contain product residue. Do not pressurize, cut, heat, or weld empty containers. Do not reuse containers without commercial cleaning and/or reconditioning. Personnel who handle this material should practice good personal hygiene during and after handling to help prevent accidental ingestion of this product. Properly dispose of contaminated leather articles including shoes that cannot be decontaminated.
Storage	Store in dry, cool, well-ventilated area. Store away from heat and sources of ignition. Keep container tightly closed. Store away from incompatible and reactive materials (See section 5 and 10).

Section 8. Exposure Controls/Personal Protection

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

Section 9. Physical and Chemical Properties

Physical State and Appearance	Viscous liquid.	**Viscosity**	40: 145.5 cSt @ 40°C (104°F), 14.55 cSt @ 100°C (212°F), VI=98 1740: 146.4 cSt @ 40°C (104°F), 14.7 cSt @ 100°C (212°F), VI=99
Colour	Dark amber.	**Pour Point**	40: -3ºC (27ºF) 1740: -6ºC (21ºC)
Odour	Mild petroleum oil like.	**Softening Point**	Not applicable.
Odour Threshold	Not available	**Dropping Point**	Not applicable.
Boiling Point	Not available	**Penetration**	Not applicable.
Density	0.8946 - 0.8971 kg/L @ 15°C (59°F).	**Oil / Water Dist. Coefficient**	Not available
Vapour Density	Not available	**Ionicity (in water)**	Not available
Vapour Pressure	Negligible at ambient temperature and pressure.	**Dispersion Properties**	Not available
Volatility	Non-volatile.	**Solubility**	Insoluble in water.

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Section 10. Stability and Reactivity

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

Section 11. Toxicological Information

Routes of Entry	Skin contact, eye contact, inhalation and ingestion.
Acute Lethality	Based on toxicity of components or similar products: Acute oral toxicity (LD50): >5000 mg/kg (rat). Acute dermal toxicity (LD50): >2000 mg/kg (rabbit). Acute inhalation toxicity (LC50): >2500 mg/m³/4h (rat).
Chronic or Other Toxic Effects	
Dermal Route:	Prolonged or repeated contact may cause skin irritation characterized by dermatitis or oil acne.
Inhalation Route:	Negligible breathing hazard at normal temperatures (up to 38°C) or recommended blending temperatures. Elevated temperatures or mechanical action may form vapours or mists. Inhalation of oil mists or vapours from hot oil may cause irritation of the upper respiratory tract.
Oral Route:	Low toxicity; has laxative effect.
Eye Irritation/Inflammation:	Repeated or prolonged contact may cause transient irritation, but no permanent damage.
Immunotoxicity:	Not available
Skin Sensitization:	This product is not expected to be a skin sensitizer, based on the available data and the known hazards of the components.
Respiratory Tract Sensitization:	This product is not expected to be a respiratory tract sensitizer, based on the available data and the known hazards of the components.
Mutagenic:	This product is not expected to be a mutagen, based on the available data and the known hazards of the components.
Reproductive Toxicity:	This product is not expected to be a teratogen or an embryotoxin, based on the available data and the known hazards of the components.
Teratogenicity/Embryotoxicity:	This product is not expected to be a reproductive hazard, based on the available data and the known hazards of the components.
Carcinogenicity (ACGIH):	This product is not known to contain any chemicals at reportable quantities that are listed as A1 or A2 carcinogens by ACGIH.
Carcinogenicity (IARC):	This product is not known to contain any chemicals at reportable quantities that are listed as group 1, 2A or 2B carcinogens by IARC.
Carcinogenicity (NTP):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by NTP.
Carcinogenicity (IRIS):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by IRIS.
Carcinogenicity (OSHA):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by OSHA.
Other Considerations	No additional remark.

Section 12. Ecological Information

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

Section 13. Disposal Considerations

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

Section 14. Transport Information

TDG Classification	Not controlled under TDG (Canada).	**Special Provisions for Transport**	Not applicable.

Section 15. Regulatory Information

Other Regulations

This product is acceptable for use under the provisions of WHMIS-CPR. All components of this formulation are listed on the CEPA-DSL (Domestic Substances List).

All components of this formulation are listed on the US EPA-TSCA Inventory.

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

Please contact Product Safety for more information.

DSD/DPD (Europe)	Not evaluated.	**HCS (U.S.A.)**	Not controlled under the HCS (United States).
ADR (Europe) (Pictograms)	**NOT EVALUATED FOR EUROPEAN TRANSPORT** **NON ÉVALUÉ POUR LE TRANSPORT EUROPÉEN.**	**DOT (U.S.A) (Pictograms)**	

HMIS (U.S.A.)

Health Hazard	1
Fire Hazard	1
Reactivity	0
Personal Protection	B

NFPA (U.S.A.)

Rating

0 Insignificant
1 Slight
2 Moderate
3 High
4 Extreme

Section 16. Other Information

References Available upon request.

* Marque de commerce de Petro-Canada - Trademark

Glossary

ACGIH - American Conference of Governmental Industrial Hygienists
ADR - Agreement on Dangerous goods by Road (Europe)
ASTM - American Society for Testing and Materials (
BOD5 - Biological Oxygen Demand in 5 days
CAN/CGA B149.2 Propane Installation Code
CAS - Chemical Abstract Services
CEPA - Canadian Environmental Protection Act
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CFR - Code of Federal Regulations
CHIP - Chemicals Hazard Information and Packaging Approved Supply List
COD5 - Chemical Oxygen Demand in 5 days
CPR - Controlled Products Regulations
DOT - Department of Transport
DSCL - Dangerous Substances Classification and Labeling (Europe)
DSD/DPD - Dangerous Substances or Dangerous Preparations Directives (Europe)
DSL - Domestic Substance List
EEC/EU - European Economic Community/European Union
EINECS - European Inventory of Existing Commercial Chemical Substances
EPCRA - Emergency Planning and Community Right to Know Act
FDA - Food and Drug Administration
FIFRA - Federal Insecticide, Fungicide and Rodenticide Act
HCS - Hazardous Communication System
HMIS - Hazardous Material Information System
IARC - International Agency for Research on Cancer
IRIS - Integrated Risk Information System
LD50/LC50 - Lethal Dose/Concentration kill 50%
LDLo/LCLo - Lowest Published Lethal Dose/Concentration
NAERG'96 - North American Emergency Response Guide Book (1996)
NFPA - National Fire Prevention Association
NIOSH - National Institute for Occupational Safety & Health
NPRI - National Pollutant Release Inventory
NSNR - New Substances Notification Regulations (Canada)
NTP - National Toxicology Program
OSHA - Occupational Safety & Health Administration
PEL - Permissible Exposure Limit
RCRA - Resource Conservation and Recovery Act
SARA - Superfund Amendments and Reorganization Act
SD - Single Dose
STEL - Short Term Exposure Limit (15 minutes)
TDG - Transportation Dangerous Goods (Canada)
TDLo/TCLo - Lowest Published Toxic Dose/Concentration
TLm - Median Tolerance Limit
TLV-TWA - Threshold Limit Value-Time Weighted Average
TSCA - Toxic Substances Control Act
USEPA - United States Environmental Protection Agency
USP - United States Pharmacopoeia
WHMIS - Workplace Hazardous Material Information System

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

Lubricants:
Western Canada, telephone: 1-800-661-1199; fax: (780) 464-9564
Ontario & Central Canada, telephone: 1-800-268-5850 and (905) 822-4222; fax: 1-800-201-6285
Quebec & Eastern Canada, telephone: 1-800-576-1686; fax: 800-201-6285

For Product Safety Information: (905) 804-4752

Prepared by Product Safety - JDW on 3/24/2003.

Data entry by Product Safety - JDW.

PETRO-CANADA

Material Safety Data Sheet

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing	TDG (pictograms)
	**Not controlled**		

Section 1. Chemical Product and Company Identification

Product Name	**PETRO-CANADA SUPREME 5W-30, 10W-30, 10W-40, 20W-50 MOTOR OIL**	**Code**	410-344, MOSP53 410-341, MOSP13 410-342, MOSP14 410-343, MOSP25
Synonym	Not available.	**Validated on**	**8/31/2004.**
Manufacturer	PETRO-CANADA P.O. Box 2844 Calgary, Alberta T2P 3E3	**In case of Emergency**	Petro-Canada: 403-296-3000 Canutec Transportation: 613-996-6666 Poison Control Centre: Consult local telephone directory for emergency number(s).
Material Uses	Supreme is designed for the lubrication of all gasoline, propane and CNG engines where the manufacturer recommends the use of API SM quality oils. SAE 5W-30 and 10W-30 grades also meet the requirements of ILSAC GF-4.		

Section 2. Composition and Information on Ingredients

			Exposure Limits (ACGIH)		
Name	**CAS #**	**% (W/W)**	**TLV-TWA(8 h)**	**STEL**	**CEILING**
Mixture of severely hydrotreated and hydrocracked base oil (petroleum) and other proprietary, non-hazardous additives.	Mixture	100	5 mg/m³ (oil mist)	10 mg/m³ (oil mist)	Not established

Manufacturer Recommendation	Not applicable
Other Exposure Limits	Consult local, state, provincial or territory authorities for acceptable exposure limits.

Section 3. Hazards Identification.

Potential Health Effects	Prolonged or repeated contact may cause skin irritation, defatting, drying and dermatitis. Not expected to cause more than slight skin or eye irritation. With its relatively low vapour pressure, this product is not expected be inhaled in any appreciable quantity at ambient conditions. If heated to high temperatures or subjected to mechanical actions which produce vapours or mists, inhalation may cause respiratory tract irritation. Ingestion may produce a laxative effect. For more information refer to Section 11 of this MSDS.

Section 4. First Aid Measures

Eye Contact	No effects expected. If irritation does occur, flush contaminated eye(s) with lukewarm, gently flowing water for 5 minutes or until the chemical is removed. If irritation persists, obtain medical advice.
Skin Contact	Quickly and gently, blot or brush away excess chemical. Wash gently and thoroughly with water and non-abrasive soap for 5 minutes or until chemical is removed. Remove contaminated clothing, shoes and leather goods (e.g., watchbands, belts, etc.). If irritation persists, repeat flushing. Obtain medical advice immediately. Completely decontaminate clothing, shoes and leather goods before reuse or discard.
Inhalation	Remove source of contamination or move victim to fresh air. If irritation persists, obtain medical advice.
Ingestion	NEVER give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing. DO NOT INDUCE VOMITING. Have victim drink 240 to 300 mL (8 to 10 oz) of water to dilute material in stomach. If vomiting occurs naturally, rinse mouth and repeat administration of water. Obtain medical attention.
Note to Physician	Not available

Section 5. Fire-fighting Measures

Flammability	May be combustible at high temperature.	**Flammable Limits**	Not available.
Flash Points	OPEN CUP: ≥200°C (392°F) (Cleveland)	**Auto-Ignition Temperature**	Not available
Fire Hazards in Presence of Various Substances	Low fire hazard. This material must be heated before ignition will occur.	**Explosion Hazards in Presence of Various Substances**	Do not cut, weld, heat, drill or pressurize empty container. Containers may explode in heat of fire.
Products of Combustion	Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), calcium oxides (CaOx), phosphorus compounds (POx), zinc oxides, boron oxides and molybdenum, smoke and irritating vapours as products of incomplete combustion.		
Fire Fighting Media and Instructions	NAERG96, GUIDE 171, Substances (low to moderate hazard). If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (0.5 mile) in all directions; also, consider initial evacuation for 800 meters (0.5 mile) in all directions. Shut off fuel to fire if it is possible to do so without hazard. If this is impossible, withdraw from area and let fire burn out under controlled conditions. Withdraw immediately in case of rising sound from venting safety device or any discolouration of tank due to fire. Cool containing vessels with water spray in order to prevent pressure build-up, autoignition or explosion. SMALL FIRE: use DRY chemicals, foam, water spray or CO2. LARGE FIRE: use water spray, fog or foam. For small outdoor fires, portable fire extinguishers may be used, and self contained breathing apparatus (SCBA) may not be required. For all indoor fires and any significant outdoor fires, SCBA is required. Respiratory and eye protection are required for fire fighting personnel.		

Section 6. Accidental Release Measures

Material Release or Spill	Consult current National Emergency Response Guide Book (NAERG) for appropriate spill measures if necessary. Extinguish all ignition sources. Stop leak if safe to do so. Dike spilled material. Use appropriate inert absorbent material to absorb spilled product. Collect used absorbent for later disposal. Avoid contact with spilled material. Avoid contaminating sewers, streams, rivers and other water courses with spilled material. Notify appropriate authorities immediately.

Section 7. Handling and Storage

Handling	Avoid contact with any sources of ignition, flames, heat, and sparks. Avoid skin contact. Avoid eye contact. Avoid inhalation of product vapours or mists. Empty containers may contain product residue. Do not pressurize, cut, heat, or weld empty containers. Do not reuse containers without commercial cleaning and/or reconditioning. Personnel who handle this material should practice good personal hygiene during and after handling to help prevent accidental ingestion of this product. Properly dispose of contaminated leather articles including shoes that cannot be decontaminated.
Storage	Store away from incompatible and reactive materials (See section 5 and 10). Keep container tightly closed. Store in dry, cool, well-ventilated area.

Section 8. Exposure Controls/Personal Protection

Engineering Controls	For normal application, special ventilation is not necessary. If user's operations generate vapours or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. Make-up air should always be supplied to balance air removed by exhaust ventilation. Ensure that eyewash station and safety shower are close to work-station.
Personal Protection - ***The selection of personal protective equipment varies, depending upon conditions of use.***	
Eyes	As a minimum, safety glasses with side shields should be worn when handling this material.
Body	If this material may come in contact with the body during handling and use, we recommend wearing appropriate protective clothing to prevent contact with the skin. (Contact your PPE provider for more information.)
Respiratory	A minimum of NIOSH-approved air-purifying respirator with an organic vapour cartridge or canister with a dust, fume of mist filter (R, or P series) may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. A NIOSH-approved positive-pressure, air-supplied respirator or self-contained breathing apparatus may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits.
Hands	If this material may come in contact with the hands during handling and use, we recommend wearing gloves of the following material(s): Neoprene, Nitrile, Polyvinyl alcohol (PVA), Fluoro-elastomer. Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns.
Feet	Wear appropriate footwear to prevent product from coming in contact with feet and skin.

Section 9. Physical and Chemical Properties

Physical State and Appearance	Viscous liquid.	**Viscosity**	5W-30: 62.3 cSt @ 40°C (104°F), 10.6 cSt @ 100ºC (212ºF). VI=160 10W-30: 67.4 cSt @ 40°C (104°F), 10.5 cSt @ 100ºC (212ºF). VI=143 10W-40: 97.2 cSt @ 40°C (104°F), 14.1 cSt @ 100ºC (212ºF). VI=143 20W-50: 170 cSt @ 40°C (104°F), 19.0 cSt @ 100ºC (212ºF). VI=127
Colour	Light amber.	**Pour Point**	5W-30: -36°C (-33ºF) 10W-30: -36°C (-33ºF) 10W-40: -30°C (-22ºF) 20W-50: -24°C (-11ºF)
Odour	Mild petroleum oil like.	**Softening Point**	Not applicable.
Odour Threshold	Not available.	**Dropping Point**	Not applicable.
Boiling Point	Not available.	**Penetration**	Not applicable.
Density	0.8566 - 0.8775 kg/L @ 15°C (59°F).	**Oil / Water Dist. Coefficient**	Not available.
Vapour Density	Not available.	**Ionicity (in water)**	Not available
Vapour Pressure	Negligible at ambient temperature and pressure.	**Dispersion Properties**	Not available
Volatility	Non-volatile	**Solubility**	Insoluble in water.

Section 10. Stability and Reactivity

Corrosivity	Copper corrosion, 3h, 121°C (ASTM D0130): 1a		
Stability	The product is stable under normal handling and storage conditions.	**Hazardous Polymerization**	Will not occur under normal working conditions.
Incompatible Substances / Conditions to Avoid	Reactive with oxidizing agents and acids.	**Decomposition Products**	May release COx, H2S, methacrylate monomers, alkyl mercaptans, smoke and irritating vapours when heated to decomposition.

Section 11. Toxicological Information

Routes of Entry	Skin contact, eye contact, inhalation, and ingestion.
Acute Lethality	Acute toxicity information is not available for the product as a whole, therefore, data for the base oils are provided below: Acute oral toxicity (LD50): >5000 mg/kg (rat). Acute dermal toxicity (LD50): >2000 mg/kg (rabbit). Acute inhalation toxicity (LC50): >2500 mg/m³/4h (rat).

Chronic or Other Toxic Effects

Dermal Route:	Prolonged or repeated contact may defat and dry skin, and cause dermatitis. Short-term exposure is expected to cause only slight irritation, if any.
Inhalation Route:	With its relatively low vapour pressure, this product is not expected be inhaled in any appreciable quantity at ambient conditions. If heated to high temperatures or subjected to mechanical actions which produce vapours or mists, inhalation may cause respiratory tract irritation.
Oral Route:	Ingestion of this product may lead to aspiration of the liquid, especially if vomiting occurs. This may result in chemical pneumonitis (inflammation of the lungs) and/or pulmonary edema (an accumulation of fluid in the lungs). May produce a laxative effect.
Eye Irritation/Inflammation:	Short-term exposure is expected to cause only slight irritation, if any.
Immunotoxicity:	Not available.
Skin Sensitization:	Contact with this product is not expected to cause skin sensitization, based upon the available data and the known hazards of the components.
Respiratory Tract Sensitization:	Contact with this product is not expected to cause respiratory tract sensitization, based upon the available data and the known hazards of the components.
Mutagenic:	This product is not known to contain any components at >= 0.1% that have been shown to cause mutagenicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a mutagen.

Continued on Next Page

Reproductive Toxicity:	This product is not known to contain any components at >= 0.1% that have been shown to cause reproductive toxicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a reproductive toxin.
Teratogenicity/Embryotoxicity:	This product is not known to contain any components at >= 0.1% that have been shown to cause teratogenicity and/or embryotoxicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a teratogen/embryotoxin.
Carcinogenicity (ACGIH):	This product is not known to contain any chemicals at reportable quantities that are listed as Group A1 or A2 carcinogens by ACGIH.
Carcinogenicity (IARC):	This product is not known to contain any chemicals at reportable quantities that are listed as Group 1, 2A, or 2B carcinogens by IARC.
Carcinogenicity (NTP):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by NTP.
Carcinogenicity (IRIS):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by IRIS.
Carcinogenicity (OSHA):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by OSHA.
Other Considerations	No additional remark.

Section 12. Ecological Information

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

Section 13. Disposal Considerations

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

Section 14. Transport Information

TDG Classification	Not a hazardous material for transport according to the TDG Regulations. (Canada)	**Special Provisions for Transport**	Not applicable.

Section 15. Regulatory Information

Other Regulations

This product is acceptable for use under the provisions of WHMIS-CPR. All components of this formulation are listed on the CEPA-DSL (Domestic Substances List).

All components of this formulation are listed on the US EPA-TSCA Inventory.

All components of this product are on the European Inventory of Existing Commercial Chemical Substances (EINECS).

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

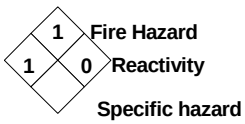
Please contact Product Safety for more information.

DSD/DPD (Europe)	Not evaluated.	**HCS (U.S.A.)**	Does not meet the definitions of a health or physical hazard according to the OSHA - Hazard Communication Standard. (United States)
ADR (Europe) (Pictograms)	NOT EVALUATED FOR EUROPEAN TRANSPORT NON ÉVALUÉ POUR LE TRANSPORT EUROPÉEN.	**DOT (U.S.A) (Pictograms)**	

HMIS (U.S.A.)

Health Hazard	1
Fire Hazard	1
Reactivity	0
Personal Protection	B

NFPA (U.S.A.)



Rating
0 Insignificant
1 Slight
2 Moderate
3 High
4 Extreme

Section 16. Other Information

References Available upon request.
* Marque de commerce de Petro-Canada - Trademark

Glossary

ACGIH - American Conference of Governmental Industrial Hygienists
ADR - Agreement on Dangerous goods by Road (Europe)
ASTM - American Society for Testing and Materials
BOD5 - Biological Oxygen Demand in 5 days
CAN/CGA B149.2 Propane Installation Code
CAS - Chemical Abstract Services
CEPA - Canadian Environmental Protection Act
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CFR - Code of Federal Regulations
CHIP - Chemicals Hazard Information and Packaging Approved Supply List
COD5 - Chemical Oxygen Demand in 5 days
CPR - Controlled Products Regulations
DOT - Department of Transport
DSCL - Dangerous Substances Classification and Labeling (Europe)
DSD/DPD - Dangerous Substances or Dangerous Preparations Directives (Europe)
DSL - Domestic Substance List
EEC/EU - European Economic Community/European Union
EINECS - European Inventory of Existing Commercial Chemical Substances
EPCRA - Emergency Planning and Community Right to Know Act
FDA - Food and Drug Administration
FIFRA - Federal Insecticide, Fungicide and Rodenticide Act
HCS - Hazard Communication Standard
HMIS - Hazardous Material Information System
IARC - International Agency for Research on Cancer
IRIS - Integrated Risk Information System
LD50/LC50 - Lethal Dose/Concentration kill 50%
LDLo/LCLo - Lowest Published Lethal Dose/Concentration
NAERG'96 - North American Emergency Response Guide Book (1996)
NFPA - National Fire Prevention Association
NIOSH - National Institute for Occupational Safety & Health
NPRI - National Pollutant Release Inventory
NSNR - New Substances Notification Regulations (Canada)
NTP - National Toxicology Program
OSHA - Occupational Safety & Health Administration
PEL - Permissible Exposure Limit
RCRA - Resource Conservation and Recovery Act
SARA - Superfund Amendments and Reorganization Act
SD - Single Dose
STEL - Short Term Exposure Limit (15 minutes)
TDG - Transportation Dangerous Goods (Canada)
TDLo/TCLo - Lowest Published Toxic Dose/Concentration
TLm - Median Tolerance Limit
TLV-TWA - Threshold Limit Value-Time Weighted Average
TSCA - Toxic Substances Control Act
USEPA - United States Environmental Protection Agency
USP - United States Pharmacopoeia
WHMIS - Workplace Hazardous Material Information System

For Copy of MSDS

The Canadian Controlled Products Regulations (CPR) (Under the Hazardous Products Act, part of the WHMIS legislation) only apply to WHMIS Controlled (i.e., hazardous) products. Therefore, the CPR and the 3-year update rule specified therein do not apply to WHMIS Non-Controlled products. Although this is true, customarily Petro-Canada reviews and updates Non-Controlled product MSDS if a customer requests such an update. These Non-Controlled product updates are given a lower priority than Controlled products but are handled as soon as practicable. If you would like to verify if the MSDS you have is the most current, or you require any further information, please contact:

Internet: www.petro-canada.ca

Lubricants:
Western Canada, telephone: 1-800-661-1199; fax: (780) 464-9564
Ontario & Central Canada, telephone: 1-800-268-5850 and (905) 822-4222; fax: 1-800-201-6285
Quebec & Eastern Canada, telephone: 1-800-576-1686; fax: 800-201-6285

For Product Safety Information: (905) 804-4752

Prepared by Product Safety - TLM on 8/31/2004.

Data entry by Product Safety - RS.

Material Safety Data Sheet

Trade Name: **UCARTHEM CLEAR HEAT TRANSFER FLUID** **Manufacturer:** **Van Waters and Rogers**

MSDS Code: **Type of Chemical:**

Notes:
MATERIAL SAFETY DATA SHEET

VAN WATERS & ROGERS LTD.
9800 VAN HORNE WAY
RICHMOND, B.C.
V6X 1W5

VAN WATERS & ROGERS PRODUCT:
MSDS NUMBER: LA1331

DATE PRINTED: 10/08/98

VERSION 1

AMOCO
ATTN HEIDE
FAX 403 894 7031

WHMIS CODES: D.2A D.2B

----------EMERGENCY ASSISTANCE----------

FOR EMERGENCY ASSISTANCE INVOLVING CHEMICALS CALL CHEMTREC
(800) 424-9300

1. PRODUCT INFORMATION

PRODUCT NAME: Ucartherm Clear Heat Transfer Fluid
MSDS # : LA1331
SYNONYMS: Not available
MOL. FORMULA: Not applicable
GENERIC NAME: Not available
GENERAL USES: Not available
CHEMICAL NAME: Not applicable
CAS NUMBER: Not applicable

TRANSPORTATION OF DANGEROUS GOODS:
SHIPPING NAME: None
CLASSIFICATION: Not controlled under TDG (Canada).
PIN: Not applicable (PIN and PG)
PACKING GROUP: None

CLASSIFICATION: WHMIS CLASS D-2A: Material causing other toxic effects (very toxic)

WHMIS CLASS D-2B : Material causing other toxic effects (TOXIC).

2. HAZARDOUS INGREDIENTS

INGREDIENT CAS # %WT TLV

Ethylene glycol 000107211 90-95 Not Available
Sodium tolytriazole 64665-57-2 <0.1 Not available
Potassium phosphate 007758114 1-3 Not available
Dibasic

LD50 / LC50
Ethylene glycol:
ORAL (LD50): Acute: 4700 mg/kg (Rat)
DERMAL (LD50) Acute: 9530 mg/kg (Rabbit)

Sodium tolyltriazole:
LD50: Not available
LC50: Not available

Potassium phosphate dibasic
LD50: Not available
LC50: Not available

3. PHYSICAL PROPERTIES

The following physical data are approximate only and do not represent specification values. They should only be used in the context of this Material Safety Data Sheet.

PHYSICAL STATE: Liquid
SPECIFIC GRAVITY (20 deg C): 1.133 (Water = 1)
BOILING POINT (deg C): 164.5.C (328.1.F)
MELTING POINT (deg C): May start to solidify at –13.C (8.6 F) based on data for : Ethylene glycol.
PH: Not available
OIL WATER DISTRIBUTION COEFFICENT: Not available
SOLUBILITY: Easily soluble in cold water.
APPEARANCE AND ODOR: Transparent and colorless, mild.
ODOR THRESHOLD: Not available
EVAPORATION RATE (butyl acetate=1) : 0.1 {Butyl acetate}
VAPOR DENSITY: 2.1 (Air =1)
VAPOR PRESSURE: 1.2 mm of Hg (@ 20 . C)
VOTALITY (% BY VOL.) : 96.27% (W/W)

4. FIRE AND EXPLOSION HAZARDS

FLASH POINT (deg C) : CLOSED CUP: 126.7. C (260.1 F) (PENSKY MARTENS.)
OPEN CUP: 129.4 C (264.9 F) (CLEVELAND)
FLAMMABLE LIMITS (deg C): The greatest known range is LOWER: 3.2%
(Ethylene glycol) UPPER: 15.3 %

AUTOIGNITION TEMP (% in air): The lowest known value is 398.C (748.4F) (Ethylene glycol).

FLAMMABILITY CLASSIFICATION: Combustible

EXTINGUISHING MEDIA:
SMALL FIRE: Use only DRY chemicals, CO2, water spray or foam.

LARGE FIRES: Use water spray , fog or foam. DO NOT USE WATER JETS.

FIRE FIGHTING PROCEDURES: Wear MSHA/NIOSH approved self contained breathing apparatus , or equivalent and full protective gear.

EXPLOSIVE HAZARDS: Risk 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.
Slightly explosive to explosive in presence of acids.

HAZARDOUS COMBUSTION PRODUCTS: These products are carbon oxides (CO, CO2). Some metallic oxides.

5. REACTIVITY

LEVEL OF STABILITY: The product is stable.
CONDITIONS TO AVOID: No additional remark.
INCOMPATIBILITIES: Slightly reactive to reactive with oxidizing agents.
HAZARDOUS
DECOMPOSITION
PRODUCTS: Not available

HAZARDOUS POLYMERIZATION: No

6.TOXICOLOGICAL PROPERTIES

THRESHOLD LIMIT VALUE: Not available

EFFECTS OF EXPOSURE: Very dangerous in case of eye contact (irritant), of ingestion, of inhalation, non irritant for skin. This product is an eye irritant. Inflammation of the eye is characterized by redness, watering and itching.

CARCINOGENIC EFFECTS: Classified A3 (Proven for animal) by ACGIH (Ethylene glycol).
MUTAGENIC EFFECTS: Not available
TERATOGENIC EFFECTS: Classified proven by (Ethylene glycol). The substance is toxic to kidneys, the nervous system. Toxicity of the product to the reproductive system: Not available. Repeated or prolonged exposure to the substance can produce target organs damage.

TOXICOLOGICALLY
SYNERGISTIC PRODUCTS: Not available

OTHER HEALTH HAZARDS: Very dangerous in case of eye contact (irritant) of ingestion, of inhalation. Non irritant for skin.

7.EMERGENCY FIRST AID

EYES: Check for and remove any contact lenses. IMMEDIATLEY flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. DO NOT use an eye ointment. Seek medical attention.

SKIN CONTACT
SLIGHT AND CHRONIC: No known effects on skin contact, rinse with water for a few minutes. No additional information.

INHALATION SLIGHT AND CHRONIC: Allow a victim to rest in a well ventilated area. Seek

immediate medical attention.
No additional information.

INGESTION SLIGHT AND CHRONIC: Remove dentures if any. Have conscious person drink several glasses or milk. INDUCE VOMITING by sticking finger in throat. Lower the head so that the vomit will not reenter the mouth and throat. NEVER give an unconscious person anything to ingest. Seek medical attention.
No additional information.

8. PREVENTATIVE MEASURES

PERSONAL PROTECTIVE
EQUIPMENT: Splash goggles. Lab coat. Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Gloves. Wear appropriate respirator when ventilation is inadequate.

STEPS TO BE TAKEN IF MATERIAL IS SPILLED OR RELEASED:

Dilute with water and mop up, or absorb with an insert DRY material and place in an appropriate waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

COMBUSTIBLE MATERIAL.
Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

WASTE DISPOSAL METHOD: Recycle to process if possible. Consult your local or regional authorities.

STORAGE AND HANDLING: Keep container dry. Keep in a cool place. Ground all equipment containing material. Carcinogenic, teratogenic or mutagenic materials should be stored in a separate locked safety storage cabinet or room.
Not available.

SPECIAL ENGINEERING CONTROLS: Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash station and safety shower is proximal to the work station location.

SPECIAL SHIPPING INFORMATION: Not applicable.

SPECIAL INFORMATION: No additional remark.

9. PREPARATION INFORMATION REGULATORY AFFAIRS DEPARTMENT

MSDS INFORMATION

CONTACT MSDS CO-ORDINATOR, VAN WATERS & ROGERS LTD.
DURING BUSINESS HOURS, PACIFIC TIME (604) 273-1441

DATE ISSUED: March 26, 1997
SUPERCEDES: New

** VAN WATERS & ROGERS LTD. EXPRESSLY DISCLAIMS ALL EXPRESSED OR IMPLIED WARENTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WITH

RESPECT TO THE PRODUCT PROVIDED**

FOR UPDATED COPIES OF AN MSDS, PLEAE CONTACT YOUR LOCAL VAN WATERS & ROGERS LTD. BRANCH.

REVISION INFORMATION
03/97 : New Format

Material Safety Data Sheet

Orica Canada Inc.
Maple Street
Brownsburg, PQ
For MSDS Requests: 450-533-4201

Orica USA Inc.
33101 E. Quincy Avenue
Watkins, CO 80137
For MSDS Requests: 303-268-5000

EMERGENCY CONTACTS
FOR EMERGENCIES INVOLVING CHEMICAL SPILL OR RELEASE, CALL THE ORICA CANADA TRANSPORTATION EMERGENCY
RESPONSE SYSTEM AT **1-877-561-3636, or CHEMTREC AT 1-800-424-9300**

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: **Magnafrac 1100 Series**
MATS Index: 45229
MSDS Number: 20093
Date Issued: 05-21-02
Alternate Name(s):
Magnafrac 1100, Magnafrac 1166, Magnafrac 1180, SuperAN 135
Magnafrac 1101, Magnafrac 1170, Magnafrac 1181, SuperAN 140
Magnafrac 1160, Magnafrac 1171, SuperAN 120, SuperAN 145
Magnafrac 1161, Magnafrac 1175, SuperAN 125, SuperAN 150
Magnafrac 1165, Magnafrac 1176, SuperAN 130, SuperAN 155

Product Use: Used in surface operations.

SECTION 2 - COMPOSITION / INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENT(S)	% (w/w)	ACGIH TWA	CAS NO.
Ammonium Nitrate	70-90	Not Listed.	6484-52-2
No. 1 Fuel Oil	1-5	Not Listed.	8008-20-6
Polyolefin aminoester	1-5	Not Listed.	Not Listed.

SECTION 3 - HAZARD IDENTIFICATION

Emergency Overview: May cause skin irritation. Risk of explosion by shock, friction, fire or other sources of ignition. Irritating to eyes. May cause methemoglobinemia. May cause central nervous system (CNS) depression. Read the entire MSDS for a more thorough evaluation of the hazards.

SECTION 4 - FIRST AID MEASURES

General: In case of accident or if you feel unwell, seek medical advice IMMEDIATELY (show the product label where possible).
Inhalation: Move victim to fresh air. Give artificial respiration ONLY if breathing has stopped. Give cardiopulmonary resuscitation (CPR) if there is no breathing AND no pulse. Obtain medical advice IMMEDIATELY.
Skin Contact: Wash affected areas thoroughly with soap and water. If irritation, redness, or a burning sensation develops and persists, obtain medical advice.
Eye Contact: Immediately flush eyes with running water for a minimum of 20 minutes. Hold eyelids open during flushing. If irritation persists, repeat flushing. Obtain medical attention IMMEDIATELY.
Ingestion: If victim is alert and not convulsing, rinse mouth out and give 200-300 mL (1 cup) of water to dilute material. DO NOT induce vomiting. If spontaneous vomiting occurs, have victim lean forward with head positioned to avoid breathing in of vomitus, rinse mouth and administer more water. Obtain medical attention IMMEDIATELY.
Note to Physicians: Symptomatic. Administer oxygen if there are signs of cyanosis. If clinical condition deteriorates, administer 10cc Methylene Blue intravenously. It is unlikely for this to be required with methemoglobin level of less than 40%. This product contains materials that may cause severe pneumonitis if aspirated. If ingestion has occurred less than 2 hours earlier, carry out careful gastric lavage; use endotracheal cuff if available, to prevent aspiration. Observe patient for respiratory difficulty from

aspiration pneumonitis. Give artificial resuscitation and appropriate chemotherapy if respiration is depressed. Following exposure the patient should be kept under medical review for at least 48 hours as delayed pneumonitis may occur.

SECTION 5 - FIRE-FIGHTING MEASURES

Flash Point: This product does not flash.
Flammable Limits (Lower): Not applicable.
Flammable Limits (Upper): Not applicable.
Auto Ignition Temperature: 230-265°C (446-509°F)
Decomposition Temperature: 250°C (482°F) (Ammonium Nitrate)
Rate of Burning: Does not sustain burning at atmospheric pressure.
Explosive Power: Approximately 340 kJ/100 g.
Sensitivity to Mechanical Impact: Greater than 150 cm.
Sensitivity to Static Discharge: Not sensitive.
Hazardous Reactions: None known.
Fire and Explosion Hazards: Explodes on overheating when contained and, thus, fires involving large quantities of the material should not be fought.
Extinguishing Media: See below.
Fire Fighting Procedures: DO NOT FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS. Immediately evacuate all personnel from the area.
Fire Fighting Protective Equipment: Not applicable.
NOTE: Also see "Section 10 - Stability and Reactivity"

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Spills, Leaks, or Releases: Collect product for recovery or disposal. For release to land, contain discharge by constructing dykes or applying inert absorbent; for release to water, utilize damming and/or water diversion to minimize the spread of contamination.
Collect contaminated soil and water, and absorbent for proper disposal. Notify applicable government authority if release is reportable or could adversely affect the environment. Avoid the use of metal tools. Be careful to avoid shock, friction, and contact with grit.
Deactivating Chemicals: Detergents will break up emulsions if mixed in.

SECTION 7 - HANDLING AND STORAGE

Handling: This product is an explosive and should only be used under the supervision of trained personnel. The use of coveralls is recommended. Use normal good industrial hygiene and housekeeping practices.
Storage Requirements: Store under moderate temperatures recommended by a technical service respresentative. Store under dry conditions in a well ventilated magazine that has been approved for either detonator storage or explosive storage. Do NOT store explosives in a detonator magazine or detonators in an explosive magazine. Keep away from heat, sparks and flames. Keep containers closed. Explosives should be kept well away from initiating explosives; protected from physical damage; separated from oxidizing materials, combustibles, and sources of heat. Keep away from incompatibles. Exposure to extremes of heat and cold should be avoided.
Storage Temperature: Ideal storage temperature is 20-40°C. Do not expose sealed containers to temperatures above 40°C (104°F).

SECTION 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

PREVENTIVE MEASURES:
Recommendations listed in this section indicate the type of equipment which will provide protection against over exposure to this product. Conditions of use, adequacy of engineering or other control measures, and actual exposures will dictate the need for specific protective devices at your workplace.
Engineering Controls: General ventilation is recommended. Full handling precautions should be taken at all times.
PERSONAL PROTECTIVE EQUIPMENT:
Eye Protection: Use chemical safety goggles when there is potential for eye contact.
Skin Protection: Rubber gloves and protective clothing made from cotton should be impervious under normal conditions of use.
User should verify impermeability under normal conditions of use prior to general use.

Respiratory Protection: A NIOSH/MSHA-approved respirator, if required.
EXPOSURE GUIDELINES FOR PRODUCT:
Not established for product.
EXPOSURE GUIDELINES FOR HAZARDOUS INGREDIENT(S):
Ammonium Nitrate:
Internal Guideline 5 mg/m3 (nuisance dust)

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Chemical Name: Not available.
Chemical Family: Booster-sensitive emulsion explosive.
Molecular Formula: Not applicable.
Appearance: Semi-opaque to translucent viscous liquid.
Odour: Smell of fuel oil.
Odour Threshold (ppm): 1 (No. 1 Fuel Oil)
pH: 4.0 - 6.0
Vapour Pressure (mm Hg at 20°C): 0.07 (No. 1 Fuel Oil)
Vapour Density (Air=1): Not available.
Boiling Point: 100 to 325°C (No. 1 Fuel Oil) (212 to 617°F)
Melting Point: -46°C (No. 1 Fuel Oil) to 167°C (Ammonium Nitrate) (-50.8°F to 332.6°F)
Solubility (Water): (Negligible)
Solubility (Other): Not available.
Specific Gravity: 1.33 - 1.44
Evaporation Rate: Not available.
Bulk Density (lbs/cu ft): 83.0
Additional Properties:

SECTION 10 - STABILITY AND REACTIVITY

Hazardous Decomposition Products: Thermal decomposition products are toxic and may include hydrocarbons, oxides of carbon and nitrogen. Toxic gases and vapours (oxides of nitrogen) will be released by thermal decomposition (about 210°C). At higher temperatures, decomposition may be explosive, especially if confined.
Chemical Stability: Stable at room temperature.
Conditions to Avoid: Keep away from heat, impact, and friction.
Incompatibility with other Substances: Avoid oxidizable materials, metal powder, bronze & other copper alloys, fuels (e.g. lubricants, machine oils), fluorocarbon lubricants, acids, corrosive liquids, chlorates, sulphur, charcoal, coke and other finely divided combustibles. Strong oxidizing and reducing agents.
Hazardous Polymerization: Will not occur.

SECTION 11 - TOXICOLOGICAL INFORMATION

Summary: May cause skin irritation. Irritating to eyes. May cause central nervous system (CNS) depression. May cause methemoglobinemia.
TOXICOLOGICAL DATA:
PRODUCT:
None established for product.
INGREDIENTS:
Ammonium Nitrate:
Oral LD50 (rat) = 2217 mg/kg
Dermal LD50 (rabbit) = 3000 mg/kg
No. 1 Fuel Oil:
LD50 (oral, rat) = 5000 mg/kg
LC50 (inhalation, rat) = 5000 mg/m3/4H
POTENTIAL HEALTH EFFECTS:
Inhalation: Inhalation is not a likely route of exposure at normally encountered temperatures and is thus not applicable.
Combustion products may be irritating.
Skin Contact: May cause skin irritation.
Eye Contact: Moderate irritant causing moderate initial pain.
Ingestion: Highly unlikely under normal industrial use. Ingestion may cause irritation of the gastrointestinal tract.

Subchronic Effects: Ingestion may cause methemoglobinemia. Initial manifestation of methemoglobinemia is cyanosis, characterized by navy blue lips, tongue and mucous membranes, with skin colour being slate grey. Further manifestation is characterized by headache, weakness, dyspnea, dizziness, stupor, respiratory distress and death due to anoxia. If ingested, nitrates may be reduced to nitrites by bacteria in the digestive tract. Signs and symptoms of nitrite poisoning include methemoglobinemia, nausea, dizziness, increased heart rate, hypotension, fainting and, possibly, shock. CNS depression is characterized by headache, dizziness, drowsiness, nausea, vomiting and incoordination. Severe overexposures may lead to coma and possible death due to respiratory failure.
Chronic Effects: None known.
Carcinogenicity: The ingredients of this product are not classified as carcinogenic by ACGIH (American Conference of Governmental Industrial Hygienists) or IARC (International Agency for Research on Cancer), not regulated as carcinogens by OSHA (Occupational Safety and Health Administration), and not listed as carcinogens by NTP (National Toxicology Program).
Mutagenicity: There is no evidence of mutagenic potential.
Reproductive Effects: No information is available and no adverse reproductive effects are anticipated.
Teratogenicity and Fetotoxicity: No information is available and no adverse teratogenic/embryotoxic effects are anticipated.
Synergistic Materials: None known.

SECTION 12 - ECOLOGICAL INFORMATION

Ecotoxicological Information: Dissolves slowly in water. Harmful to aquatic life at low concentrations.
Environmental Effects: Can be dangerous if allowed to enter drinking water intakes. Do not contaminate domestic or irrigation water supplies, lakes, streams, ponds, or rivers.
Persistence and Degradation: Water-insoluble and remains explosive. With extended time periods, some ingredients will solubilize.

SECTION 13 - DISPOSAL CONSIDERATIONS

Burn under supervision of an expert at an explosive burning ground or destroy, by detonation in boreholes, in accordance with applicable local, provincial and federal regulations. Call upon the services of an Orica Technical Representative.

SECTION 14 - TRANSPORT INFORMATION

TDG Name: Explosive, Blasting, Type E
TDG Class/Division: 1.5D
Product Indentification Number (PIN): UN0332
Packing Group: II
Transportation Emergency Telephone Number: 1-877-561-3636 or 1-800-424-9300

SECTION 15 - REGULATORY INFORMATION

CANADIAN CLASSIFICATION:
This product has been classified in accordance with the hazard criteria of the CPR (Controlled Products Regulations) and this MSDS (Material Safety Data Sheet) contains all the information required by the CPR.
Controlled Products Regulations (WHMIS) Classification: This product is an explosive and is not regulated by WHMIS.
CEPA / Canadian Domestic Substances List (DSL): The substance(s) in this product is/are on the Canadian Domestic
Substances List (CEPA DSL).
IARC Classification: None of the components of this product are listed on IARC.
USA CLASSIFICATION:
OSHA Classification:
Physical: Explosive. Oxidizer.
Health: Irritant.
Target Organ: Central nervous system. Blood/hematopoietic system.
SARA Regulations Sections 313 and 40 CFR 372: This product contains the following toxic chemical(s) subject to reporting requirements: 70-90% Ammonium Nitrate (6484-52-2)
Ozone Protection and 40 CFR 42: This product does not contain nor is it manufactured with ozone depleting substances.

Other Regulations/Legislation which apply to this product: Massachusetts Right-to-Know, Pennsylvania Right-to-Know, New Jersey Right-to-Know, CERCLA.

SECTION 16 - OTHER INFORMATION

MATS Index: 45229

REFERENCES:

RTECS-Registry of Toxic Effects of Chemical Substances, On- line search, Canadian Centre for Occupational Health and Safety RTECS database, National Institute for Occupational Safety and Health, U.S. Dept. of Health & Human Services, Cincinnati, 1994.

Clayton, G.D. and Clayton, F.E., Eds., Patty's Industrial Hygiene and Toxicology, 3rd ed., Vol. IIA,B,C, John Wiley and Sons, New York, 1981.

Supplier's Material Safety Data Sheets.

"CHEMINFO", through "CCINFOdisc", Canadian Centre for Occupational Health and Safety, Hamilton, Ontario, Canada.

Documentation of the Threshold Limit Values and Biological Exposure Indices, 5th ed., American Conference of Governmental Industrial Hygienists Inc., Cincinnati, 1986.

Windholz, Martha, Ed., The Merck Index, 11th ed., Merck and Co., Inc., Rahway, New Jersey, 1989.

Prepared by: Safety, Health and Environment (303) 268-5000

GRAYMONT

MATERIAL SAFETY DATA SHEET

SECTION I - CHEMICAL PRODUCT AND COMPANY INFORMATION

Material Name / Identifier: **HYDRATED LIME**	**WHMIS CLASS E : CORROSIVE MATERIAL**

MANUFACTURER'S AND SUPPLIER'S NAME:

GRAYMONT (NB) INC	4634, Route 880, Havelock, New Brunswick, E4Z 5K8.
GRAYMONT (QC) INC.	25, rue De Lauzon, Boucherville (Québec), J4B 1E7.
GRAYMONT (PA) INC.	965, East College avenue, Pleasant Gap, PA 16823
GRAYMONT (WESTERN CANADA) INC.	190 – 3025, 12 Street N.E., Calgary, Alberta, T2E 7J2
GRAYMONT (WESTERN US) INC.	3950 South, 700 East, Suite 301, Salt Lake City, Utah 84107

EMERGENCY TEL. No.: (613) 996 – 6666 CANUTEC (Canada) (800) 424 – 9300 CHEMTREC (US)

Chemical Name	Chemical Family	Chemical Formula
Calcium hydroxide	**Alkaline earth hydroxide**	**Complex mixture - mostly $Ca(OH)_2$**
Molecular Weight	Trade Name and Synonyms	Material Use
$Ca(OH)_2$ = 74.096	**High Calcium Hydrated Lime, Lime, Slaked lime, Lime Putty, Lime Slurry, Milk of Lime, Calcium Hydroxide**	**Neutralization, Flocculation, Stabilization, absorption**

SECTION II - COMPOSITION AND INFORMATION ON INGREDIENTS

Hazardous Ingredients	Approximate Concentration (% by weight)	C.A.S. Number	Exposure limits (**mg/m^3**)					
			OSHA PEL	ACGIH TLV	RSST VEMP	MSHA PEL (**Note 2**)	NIOSH REL	NIOSH IDLH
(Complex Mixture)	**(% by weight)**		**(TWA) 8/40h**	**(TWA) 8/40h**	**(TWA) 8/40h**	**(TWA) 8/40h**	**(TWA) 10/40h**	
Calcium hydroxide	**92 to 100**	**1305-62-0**	**5**	**5**	**5**	**5**	**N/A**	**N/A**
Crystalline Silica, Quartz	**0.1 to 1**	**14808-60-7**	**10/(%SiO_2)+2 (respirable silica dust)**	**0.1 (respirable silica dust)**	**0.1 (respirable silica dust)**	**10/(%SiO_2)+2 (respirable silica dust)**	**0.05 (respirable free silica)**	**50**
Crystalline Silica, Quartz	**0 to 0.1** (**Note 1**)	**14808-60-7**	**10/(%SiO2)+2 (respirable silica dust)**	**0.1 (respirable silica dust)**	**0.1 (respirable silica dust)**	**10/(%SiO2)+2 (respirable silica dust)**	**0.05 (respirable free silica)**	**50**

(**note 1**) : Concentration of crystalline silica in a series of lime products will vary from source to source. It was not detected on some samples (< 0.1% w/w). Therefore two ranges are being disclosed. **(Note 2)** : ACGIH TLV Version 1973 has been adopted by the Mine Safety Health Administration (MSHA) as the regulatory Exposure Standard.

SECTION III - PHYSICAL AND CHEMICAL DATA

Physical State	Odor and Appearance		Odor Threshold (p.p.m.)	Specific Gravity
Gas ☐ Liquid ☐ Solid ☑	**Slight earthy odor – Fine white powder**		**Not applicable**	**2.3 – 2.4**
Vapor Pressure (mm)	Vapor Density (Air = 1)	Evaporation Rate	Boiling Point (°C)	Melting Point (°C)
Not applicable	**Not applicable**	**Not applicable**	**Not applicable**	**Not applicable**
Solubility in Water (20°C)	Volatiles (% by volume)	pH (25 °C)	Bulk Density (kg/m^3)	Coefficient of water/oil distribution
0.165g/100g Sat.soln	**Not applicable**	**Sat. soln $Ca(OH)_2$ 12.45**	**320 - 690**	**Not applicable**

SECTION IV - FIRE OR EXPLOSION HAZARD DATA

Flammability

Yes ☐ No ☑ If yes, under which conditions?

Extinguishing Media

Calcium Hydroxide does not burn. Use extinguishing media appropriate to surrounding fire conditions.

Special Fire Fighting Procedures

Not applicable

Flash point (^{o}C) and Method	Upper flammable limit (% by volume)	Lower flammable limit (% by volume)
Not applicable	**Not applicable**	**Not applicable**
Auto Ignition Temperature (°C)	TDG Flammability Classification	Hazardous Combustion Products
Not applicable	**Non-flammable**	**None**

Dangerous Combustion Products **None**

EXPLOSION DATA

Sensitivity to Chemical Impact	Rate of Burning	Explosive Power	Sensitivity to Static Discharge
Not applicable	**Not applicable**	**Not applicable**	**Not applicable**

SECTION V - REACTIVITY DATA

Chemical Stability

Yes ☐ No ☑ | If no, under which conditions? | **Absorbs carbon dioxide in the air to form calcium carbonate.**

Incompatibility to other substances

Yes ☑ No ☐ | If so, which ones? | **Boron tri-fluoride, chlorine tri-fluoride, ethanol, fluorine, hydrogen fluoride, phosphorus pentoxide; and acids (violent reaction with generating heat and possible explosion in confined area).**

Reactivity

Yes ☑ No ☐ | If so, under which conditions? | **Reacts violently with strong acids. Reacts chemically with acids and many other compounds and chemical elements to form calcium based compounds. Explosive when mixed with nitro organic compounds.**

Hazardous Decomposition Products | **Thermal decomposition at 540^{o}C will produce calcium oxide and water.**

Hazardous Polymerization Products | **Will not occur.**

SECTION VI - TOXICOLOGICAL PROPERTIES

Route of Entry

☑ Skin Contact ☐ Skin Absorption ☑ Eye Contact ☑ Acute Inhalation ☐ Chronic Inhalation ☑ Ingestion

Effects of Acute Exposure to Product

Skin: **Mucous and skin corrosion, removes natural skin oils.**

Eyes: **Severe eye irritation, intense watering of the eyes, possible lesions, possible blindness when exposed for prolonged period. Eye-Rabbit-10mg/ 24 h – Severe.**

Inhalation: **If inhaled in form of dust, irritation of breathing passages, cough, sneezing.**

Ingestion: **If ingested: pain, vomiting blood, diarrhea, collapse, drop in blood pressure (indicates perforation of esophagus or stomach).**

Effects of Chronic Exposure to Product:

Contact dermatitis. This product may contain trace amounts of crystalline silica. Excessive inhalation of respirable crystalline silica dust may result in respiratory disease, including silicosis, pneumoconiosis and pulmonary fibrosis.

LD_{50} of Product (Specify Species and Route)	Irritancy of Product	Exposure limits of Product
(Food grade $Ca(OH)_2$: 7340mg/kg) (Rats, ingestion)	**Severe to moist tissues**	**Unavailable**
LC_{50} of Product (Specify Species)	Sensitization to Product	Synergistic materials
Unavailable	**None**	**None reported**

SECTION VI - TOXICOLOGICAL PROPERTIES (Cont'd)

☑ Carcinogenicity ☐ Reproductive effects ☐ Tératogenicity ☐ Mutagenicity

Calcium Hydroxide is not listed as a carcinogen by ACGIH, MSHA, OSHA, NTP or IARC. It may, however, contain trace amounts of Crystalline Silica listed carcinogens by these organizations. Crystalline Silica, which inhaled in the form of quartz or crystobalite from occupational sources, is classified by IARC as (Group 1) carcinogenic to humans. Silica, crystalline (Airborne particles of respirable size) is regulated under California's Safe Drinking Water and Toxic Enforcement Act of 1986. (Proposition 65). NIOSH considers crystalline silica to be potential occupational carcinogen as defined by the OSHA carcinogen policy [29 CFR 1990]. NTP lists respirable Crystalline Silica as known to be human carcinogens based on sufficient evidence of carcinogenicity in humans. ACGIH list respirable Crystalline Silica (quartz) as suspected human carcinogen (A-2).

SECTION VII - PREVENTIVE MEASURES

Personal Protective Equipment (PPE)	**Wear clean, dry gloves, full length pants over boots, long sleeved shirt buttoned at the neck, head protection and approved eye protection selected for the working conditions.**

Gloves (Specify)	Respiratory (Specify))	Eyes (Specify)	Footwear (Specify)
Gauntlets Cuff style	**NIOSH approved (N/R/P95) dust respirator**	**Tight fitting goggles with side shields. Do not wear contact lenses when handling this chemical.**	**Resistant to caustics**

Clothing (Specify)	Other (Specify)
Fully covering skin	**Evaluate degree of exposure and use PPE if necessary. After handling lime, employees must shower. If exposed daily, use oil, Vaseline, silicone base creme etc. to protect exposed skin, particularly neck, face and wrists.**

Engineering Controls (e.g. ventilation, enclosed process, specify)

Enclose dust sources; use exhaust ventilation (dust collector) at handling points, keep levels below Max. Concentration Permitted.

Leak and Spill Procedure

Limit access to trained personnel. Use industrial vacuums for large spills. Ventilate area.

Waste Disposal

Transport to disposal area or bury. Review Federal, Provincial and local Environmental regulations.

Handling Procedures and Equipment

Avoid skin and eye contact. Minimize dust generation. Wear protective goggles and in cases of insufficient ventilation, use anti-dust mask. An eye wash station and safety shower should be readily available where this material or its water dispersions are used. Contact lenses should not be worn when working with this chemical.

Storage Requirements

Keep tightly closed containers in a cool, dry and well-ventilated area, away from acids. Keep out of reach of children.

Special Shipment Information

Calcium Hydroxide is neither regulated by the Transportation of Dangerous Goods (TDG) Regulations (Canada) nor the Hazardous Materials Regulations (USA).

SECTION VIII - FIRST AID MEASURES

Skin

Carefully and gently brush the contaminated body surfaces in order to remove all traces of lime. Use a brush, cloth or gloves. Remove all lime-contaminated clothing. Rinse contaminated area with lukewarm water for 15 to 20 minutes. Consult a physician if exposed area is large or if irritation persists.

Eyes

Immediately rinse contaminated eye(s) with gently running lukewarm water (saline solution is preferred) for 15 to 20 minutes. In the case of an embedded particle in the eye, or chemical burn, as assessed by first aid trained personnel, contact a physician.

Inhalation

Move source of dust or move victim to fresh air. Obtain medical attention immediately. If victim does not breathe, give artificial respiration.

Ingestion

If victim is conscious, give 300 ml (10 oz) of water, followed by diluted vinegar (1 part vinegar, 2 parts water) or fruit juice to neutralize the alkali. Do not induce vomiting. Contact a physician immediately.

General Advise

Consult a physician for all exposures except minor instances of inhalation.

SECTION IX - REGULATORY INFORMATION

Superfund Amendments and Reauthorization Act of 1986 (**SARA Title III**) / The Emergency Planning and "Community Right-to-Know" Act (**EPCRA**) / Comprehensive Environmental Response, Compensation and Liability Act (**CERCLA**).

Component Calcium Hydroxide has been reviewed against the following regulatory listings:

- **Section 302 – Emergency Planning Notification. Extremely Hazardous Substances (EHS) List and Threshold Planning Quantity (TPQ). (40 CFR, Part 355, Section 30) : Not listed.**
- **Section 304 – Emergency Release Notification. Extremely Hazardous Substances (EHS) and Reportable Quantity (RQ) List. (40 CFR, Part 355, Section 40) : Not listed.**
- **Section 311/312 – Hazard Categories (40 CFR, Part 370) : This product is regulated under CFR 1910.1200 (OSHA Hazard Communication) as Immediate (Acute) Health Hazards - Corrosive.**
- **Section 313 – Toxics Release Inventory (TRI). Toxic Chemical List (40 CFR, Part 372). Not listed.**

CWA 311. - Clean Water Act List of Hazardous Substances.

Calcium Hydroxide has been withdrawn from the Clean Water Act (CWA) list of hazardous substances. (11/13/79) (44FR65400)

California Proposition 65.

Component Calcium Hydroxide does not appear on the above regulatory listing. This product may contain small amounts of crystalline silica. Silica, crystalline (Airborne particles of respirable size) is regulated under California's Safe Drinking Water and Toxic Enforcement Act of 1986. (Proposition 65)

Transportation - Hazardous Materials Regulations (USA) & Transportation of Dangerous Goods (TDG) Regulations (Can).

Calcium Hydroxide does not appear on the above regulatory listings

Toxic Substances Control Act (TSCA).

All naturally occurring components of this product are automatically included in the USEPA TSCA Inventory List per 40 CFR 710.4 (b). All other components are one the USEPA TSCA Inventory List. Calcium Hydroxide is exempt from reporting under the inventory update rule.

Canadian Environmental Protection Act (CEPA) – Substances Lists (DSL/NDSL).

Calcium Hydroxide appears on the Domestic Substances List (DSL).

SECTION IX - REGULATORY INFORMATION (Cont'd)

ANSI/NSF 60 - Drinking Water Treatment Additives.

Hydrated Lime has been investigated with respect to elements identified by EPA as toxic and it has been classified for use in direct contact with drinking water. (in accordance with Standard ANSI/NSF 60). For a list of classified products, refer to Underwriters Laboratories Inc.'s Online Certifications Directory.

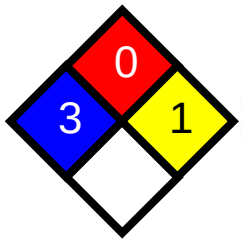
FDA - U.S. Food and Drug Administration, Department of Health and Human Services.

Calcium Hydroxide has been determined as "Generally Recognized As Safe" (GRAS) by FDA. See 21CFR184.1205. (CFR Title 21 Part 184 - - Direct food substances affirmed as generally recognized as safe).

SECTION X - OTHER INFORMATION

Hazardous Materials Identification System (U.S.)

National Fire Protection Association (U.S.)



WHMIS Classification: **"E" Corrosive Materials.**

Symbol:

WHMIS Classification: **"D2A" Materials causing other toxic effects.**

Symbol:

Additional Information/Comments:

The technical data contained herein is given as information only and is believed to be reliable.
GRAYMONT makes no guarantee of results and assumes no obligation or liability in connection therewith.

Sources Used:

NFPA, NLA, TDG, CSST, RSST, (LSRO-FASEB), Hazardous Products Act, Environment Canada, Enviroguide, OSHA, ACGIH, IARC, NIOSH, CFR, NTP, HSDB, EPA SRS, Chemistry and Technology of Lime and Limestone (John Wiley and Sons, Inc.), Lime and Limestone (WILEY-VCH).

SECTION XI - PREPARATION INFORMATION

Prepared by:	Telephone number:	Date :
GRAYMONT (QC) INC. **Technical Services**	**(450) 449-2262**	**May 2005**

LEHIGH HEIDELBERGCEMENT Group

MATERIAL SAFETY DATA SHEET

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Portland Cement

CAS #: 65997-15-1

Product Use: Preparation of concrete and mortar.

MSDS Information: This MSDS was produced in January 2005 and replaces any previous versions. This MSDS covers all types of portland cement. Individual composition of constituents will vary within the range shown in Section 2.

Product Code: Not Applicable.

Chemical Family: Calcium compounds. Calcium silicate compounds and other calcium compounds containing iron and aluminum make up the majority of this product.

Chemical Name And Synonyms: Normal Portland cement, Hydraulic cement, Sulphate Resitant cement, High Early Strength cement, Type I, Type I-II, Type III, Type II, Type II-V, Type V

Formula: This product consists of finely ground portland cement clinker, gypsum and limestone (for some products).

Supplier/Manufacturer: Lehigh Northwest Cement Limited (in Can.), Lehigh Northwest Cement Company (in USA)
P.O. Box 950, 7777 Ross Road,
Delta, British Columbia, Canada, V4K 3S6
Telephone 604-946-0411

Emergency Contact Information: Lehigh Northwest Cement Limited
P.O. Box 950, 7777 Ross Road,
Delta, British Columbia, Canada, V4K 3S6
Telephone 604-946-0411

SECTION 2 - COMPOSITION/INFORMATION ON INGREDIENTS

Portland Cement Exposure Limits:

ACGIH TLV-TWA	10 mg total dust/m^3
OSHA PEL-TWA	15 mg total dust/m^3
OSHA PEL-TWA	5 mg respirable dust/m^3

Portland Cement Ingredients & Their Exposure Limits:

Ingredient	CAS#	% By Weight	ACGIH TLV-TWA	OSHA PEL-TWA
Calcium Silicates	various	60-80%	10 mg total dust/m^3	15 mg total dust/m^3 5 mg respirable dust/m^3
Gypsum	7778-18-9	3-7%	10 mg total dust/m^3	15 mg total dust/m^3 5 mg respirable dust/m^3
Crystalline Silica	14808-60-7	less than 0.1%	0.10 mg respirable quartz/m^3 NIOSH REL (8-hour TWA) = 0.05 mg respirable quartz dust/m^3	(10 mg respirable dust/m^3)/(percent silica+2)
Calcium Carbonate	1317-65-3	1-5%	10 mg total dust/m^3	15 mg total dust/m^3 5 mg respirable dust/m^3
Magnesium Oxide	1309-48-4	1-3%	10 mg total dust/m^3	15 mg total dust/m^3
Calcium Oxide	1305-78-8	0.5-1.5%	2 mg total dust/m^3	5 mg total dust/m^3

Trace Elements:

Portland cement is made from materials mined from the earth and is processed using energy provided by fuels. Trace amounts of chemicals, some of which may be potentially harmful, might be detected during chemical analysis. For example, in addition to the ingredients listed above, portland cement may contain potassium and sodium sulfate compounds, chromium compounds (including up to 0.003% hexavalent chromium) and nickel compounds.

SECTION 3 - HAZARDS IDENTIFICATION

Emergency Overview:

Portland cement is a light gray powder that poses little immediate hazard. A single short term exposure to the dry powder is not likely to cause serious harm. However, exposure of sufficient duration to wet portland cement can cause serious, potentially irreversible tissue (skin or eye) destruction in the form of chemical (caustic) burns, including third degree burns. The same type of tissue destruction can occur if wet or moist areas of the body are exposed for sufficient duration to dry portland cement.

Potential Health Effects:

- **Relevant routes of exposure are:**

  Eye contact, skin contact, inhalation, and ingestion.

  Effects Resulting From EYE CONTACT:

  Exposure to airborne dust may cause immediate or delayed irritation or inflammation.

  Eye contact by larger amounts of dry powder or splashes of wet portland cement may cause effects ranging from moderate eye irritation to chemical burns and blindness. Such exposures require immediate first aid (see Section 4) and medical attention to prevent significant damage to the eye.

  Effects Resulting From SKIN CONTACT:

  Discomfort or pain cannot be relied upon to alert a person to a hazardous skin exposure. Consequently, the only effective means of avoiding skin injury or illness involves minimizing skin contact, particularly contact with wet cement. Exposed persons may not feel discomfort until hours after the exposure has ended and significant injury has occurred.

  Exposure to dry portland cement may cause drying of the skin with consequent mild irritation or more significant effects attributable to aggravation of other conditions. Dry portland cement contacting wet skin or exposure to moist or wet portland cement may cause more severe skin effects including thickening, cracking, or fissuring of the skin. Prolonged exposure can cause severe skin damage in the form of (caustic) chemical burns.

  Some individuals may exhibit an allergic response upon exposure to portland cement, possibly due to trace amounts of chromium. The response may appear in a variety of forms ranging from a mild rash to severe skin ulcers. Persons already sensitized may react to their first contact with the product. Other persons may first experience this effect after years of contact with portland cement products.

  Effects Resulting From INHALATION:

  Portland cement may contain trace amounts of crystalline silica. Prolonged exposure to respirable free crystalline silica may aggravate other lung conditions. It also may cause delayed lung injury including silicosis, a disabling and potentially fatal lung disease, and/or other diseases. (Also see “Carcinogenic Potential” below.)

  Exposure to portland cement may cause irritation to the moist mucous membranes of the nose, throat, and upper respiratory system. It may also leave unpleasant deposits in the nose.

  Effects Resulting From INGESTION:

  Although small quantities of dust are not known to be harmful, ill effects are possible if larger quantities are consumed. Portland cement should not be eaten.

- **Carcinogenic Potential:**

  Portland cement is not listed as a carcinogen by NTP, OSHA, or IARC. It may, however, contain trace amounts of substances listed as carcinogens by these organizations.

  Crystalline silica, a potential trace level contaminant in portland cement, is now classified by IARC as a known human carcinogen (Group 1). NTP has characterized respirable silica as “reasonably anticipated to be [a] carcinogen”.

- **Medical Conditions That May Be Aggravated By Inhalation Or Dermal Exposure:**

  Pre-existing upper respiratory and lung diseases.
  Unusual (hyper) sensitivity to hexavalent chromium (chromium^{+6}) salts.

SECTION 4 - FIRST-AID MEASURES

Eyes:

Immediately flush eyes thoroughly with water. Continue flushing for at least 15 minutes, including under lids, to remove all particles. Call physician immediately.

Skin:

Wash skin with cool water and pH-neutral soap or a mild detergent intended for use on skin. Seek medical treatment in all cases of prolonged exposure to wet cement, cement mixtures, liquids from fresh cement products, or prolonged wet skin exposure to dry cement.

Inhalation Of Airborne Dust:

Remove to fresh air. Seek medical help if coughing and other symptoms do not subside. ("Inhalation" of gross amounts of portland cement requires immediate medical attention.)

Ingestion:

Do not induce vomiting. If conscious, have the victim drink plenty of water and call a physician immediately.

SECTION 5 - FIRE-FIGHTING MEASURES

Flammability:	Not Flammable.
Flash Point:	Not Applicable.
Lower Explosive Limit:	Not Applicable.
Upper Explosive Limit:	Not Applicable.
Auto ignition Temperature:	Not Applicable.
Sensitivity To Static Discharge:	Not Applicable.
Sensitivity To Impact:	Not Applicable.
Extinguishing Media:	Not Applicable.
Special Fire-Fighting Procedures:	None.
Hazardous Combustion Products:	Not Applicable.
Unusual Fire And Explosion Hazards:	Not Applicable.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Collect dry material using a scoop. Avoid actions that cause dust to become airborne. Avoid inhalation of dust and contact with skin. Wear appropriate personal protective equipment as described in Section 8.

Scrape up wet material and place in an appropriate container. Allow the material to "dry" before disposal. Do not attempt to wash portland cement down drains.

Dispose of waste material according to local, provincial, state and federal regulations.

SECTION 7 - HANDLING AND STORAGE

Keep portland cement dry until used. Normal temperatures and pressures do not affect the material.

Promptly remove dusty clothing or clothing which is wet with cement fluids and launder before reuse. Wash thoroughly after exposure to dust or wet cement mixtures or fluids.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Eye Protection:

When engaged in activities where cement dust or wet cement or concrete could contact the eye, wear safety glasses with side shields or goggles. In extremely dusty environments and unpredictable environments, wear unvented or indirectly vented goggles to avoid eye irritation or injury. Contact lenses should not be worn when working with portland cement or fresh cement products.

Skin Protection:

Prevention is essential to avoiding potentially severe skin injury. Avoid contact with unhardened (wet) portland cement products. If contact occurs, promptly wash affected area with soap and water. Where prolonged exposure to unhardened portland cement products might occur, wear impervious clothing and gloves to eliminate skin contact. Where required, wear boots that are impervious to water to eliminate foot and ankle exposure.

Do not rely on barrier creams; barrier creams should not be used in place of gloves.

Periodically wash areas contacted by dry portland cement or by wet cement or concrete fluids with a pH-neutral soap. Wash again at the end of work. If irritation occurs, immediately wash the affected area and seek treatment. If clothing becomes saturated with wet concrete, it should be removed and replaced with clean dry clothing.

Respiratory Protection:

Avoid actions that cause dust to become airborne. Use local or general ventilation to control exposures below applicable exposure limits.

Use NIOSH/MSHA-approved (under 30 CFR 11) or NIOSH-approved (under 42 CFR 84 after July 10, 1998) respirators in poorly ventilated areas, if an applicable exposure limit is exceeded, or when dust causes discomfort or irritation.

Ventilation:

Use local exhaust or general dilution ventilation to control exposure within applicable limits.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	White to gray powder.
Odor:	No distinct odor.
Odor Threshold:	Not applicable.
Physical State:	Solid (powder).
pH (as a solid):	Not applicable.
pH (in water) (ASTM D 1293-95):	12 to 13
Solubility In Water:	Slightly soluble (0.1 to 1.0 %).
Vapor Pressure:	Not applicable.
Vapor Density:	Not applicable.
Boiling Point:	Not applicable (i.e.,>1000^{o}C).
Freezing Point:	Not applicable.
Melting Point:	Not applicable.
Specific Gravity (H_20 = 1.0):	3.15
Evaporation Rate:	Not applicable.
Coeff. Water/Oil Dist.:	Not applicable.

SECTION 10 - STABILITY AND REACTIVITY

Stability:	Stable
Conditions to avoid:	Unintentional contact with water.
Incompatibility:	Portland cement reacts with water to produce a caustic solution, pH 12 to pH 13. Wet portland cement is alkaline. As such it is incompatible with acids, ammonium salts and aluminum metal. Aluminum powder and other alkali and alkaline earth elements will react in wet mortar or concrete, liberating hydrogen gas. Portland cement dissolves in hydrofluoric acid producing corrosive silicon tetraflouride gas. Silicates react with powerful oxidizers such as fluorine, chlorine, trifluoride and oxygen difluoride.

SECTION 10 - STABILITY AND REACTIVITY (CONTINUED)

Hazardous Decomposition: Will not spontaneously occur. Adding water results in hydration and produces (caustic) calcium hydroxide.

Hazardous Polymerization: Will not occur.

SECTION 11 - TOXICOLOGICAL INFORMATION

Effects Of Acute Exposure:

Portland cement and wet portland cement mixtures can dry the skin, cause alkali burns and irritate the eyes and upper respiratory tract. Ingestion can cause irritation of the throat.

Effects Of Chronic Exposure:

Portland cement dust can cause inflammation of the tissue lining the interior of the nose and the cornea (white) of the eye.

SECTION 12 - ECOLOGICAL INFORMATION

Ecotoxicity: No recognized unusual toxicity to plants or animals.
Relevant Physical And Chemical Properties: See Sections 9 and 10.

SECTION 13 - DISPOSAL CONSIDERATIONS

Dispose of waste material according to local, provincial, state and federal regulations. (Since portland cement is stable, uncontaminated material may be saved for future use.)

Dispose of bags in an approved landfill or incinerator.

SECTION 14 - TRANSPORT INFORMATION

Hazardous materials description/proper shipping name: Portland cement is not hazardous under the TDG Act (Canada) or DOT regulations (USA).
Hazard Class: Not applicable.
Identification Number: Not applicable.
Required Label Text: Not applicable.
Hazardous substances/reportable quantities (RO): Not applicable.

SECTION 15 - REGULATORY INFORMATION

Status under USDOL-OSHA Hazard Communication Rule, 29 CFR 1910.1200:

Portland cement is considered a “hazardous chemical” under this regulation, and should be part of any hazard communication program.

Status under CERCLA/Superfund, 40 CFR 117 and 302:

Not listed.

Hazard Category under SARA (Title III), Sections 311 and 312:

Portland cement qualifies as a “hazardous substance” with delayed health effects.

Status under SARA (Title III), Section 313:

Not subject to reporting requirements under Section 313.

SECTION 15 - REGULATORY INFORMATION (CONTINUED)

Status under TSCA (as of May 1997):

Some substances in portland cement are on the TCSA inventory list.

Status under the Federal Hazardous Substances Act:

Portland cement is a "hazardous substance" subject to statutes promulgated under the subject act.

Status under California Proposition 65:

This product contains crystalline silica, a substance known to the State of California to cause cancer. This product contains chemicals (trace metals) known to the State of California to cause cancer, birth defects or other reproductive harm. California law requires the manufacturer to give the above warning in the absence of definitive testing to prove the defined risks do not exist.

Status under Canadian Environmental Protection Act:

Not listed.

Status under WHMIS:

Portland cement is considered to be a hazardous material under the Hazardous Products Act as defined by the Controlled Products Regulations and is therefore subject to the labeling and MSDS requirements of the Workplace Hazardous Materials Information System (WHMIS).

This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

SECTION 16 - OTHER INFORMATION

Prepared By:	Lehigh Northwest Cement Limited, Delta BC
Approved By:	Jasper van de Wetering, Plant Chemist
Approval Date or Revision Date:	January 31, 2005
Date Of Previous MSDS:	January 31, 2002
MSDS Number:	Not Applicable

Other Important Information:

Portland cement should only be used by knowledgeable persons. A key to using the product safely requires the user to recognize that portland cement chemically reacts with water, and that some of the intermediate products of this reaction (that is, those present while a portland cement product is "setting") pose a far more severe hazard than does portland cement itself.

While the information provided in this material safety data sheet is believed to provide a useful summary of the hazards of portland cement as it is commonly used, the sheet cannot anticipate and provide all of the information that might be needed in every situation. Inexperienced product users should obtain proper training before using this product.

In particular, the data furnished in this sheet does not address hazards that may be posed by other materials mixed with portland cement to produce portland cement products. Users should review other relevant material safety data sheets before working with this portland cement or working on portland cement products, for example, portland cement concrete.

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