



July 2010

# Spill Contingency Plan

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**ACRONYMS**

AEP	Advanced Exploration Program
ANFO	Ammonium Nitrate Fuel Oil
BSP	Bulk Sample Plant
CANUTEC	Canadian Transport Emergency Centre
DFO	Federal Department of Fisheries and Oceans
DIAND	Department of Indian and Northern Affairs Canada
EC	Environment Canada
EMR	Environmental Management Representative
EMS	Environmental Management System
ERT	Emergency Response Team (includes spills)
GNWT	Government of the Northwest Territories
HAZWOPER	Hazardous Waste Site Operations and Emergency Response Worker
HDPE	High-density Polyethylene
INAC	See DIAND
MBR	Membrane Biological Reactor
MSDS	Material Safety Data Sheets
NFCC	National Fire Code of Canada
PK	Process Kimberlite
POLs	Petroleum, Oils and Lubricants
PPE	Personal Protective Equipment
SBR	Sequencing Batch Reactor
SHE	Safety Health and Environment
STP	Sewage Treatment Plant
TDG	Transportation of Dangerous Goods
TWTP	Temporary Water Treatment Plant
WHMIS	Workplace Hazardous Materials Information System
WMP	Water Management Pond
WTP	Water Treatment Plant

## **PREAMBLE**

This Spill Contingency Plan (“the Plan”) has recently been revised and comes into effect in July 2010 at the Snap Lake Mine. This Plan is an update from the previous June 2009 Spill Contingency Plan. This Plan applies to all Phase 3 surface activities.

This Plan is not intended to address fires, explosions, accidents, injuries or fatalities. These aspects are provided in De Beers Emergency Response Plan (De Beers 2005a). A separate Hazardous Materials Management Plan (De Beers 20105) is also available for handling those types of materials.

In line with De Beers’ use of the ISO 14001 certified Environmental Management System (EMS), together with an adaptive management and approach to operations, the Plan is deemed to be iterative in nature and is subject to revision due to operational changes and or continual improvement(s).

## **CONTACT**

Any correspondence related to this Plan should be forwarded to:

De Beers Canada Inc.  
#300 – 5102 50<sup>th</sup> Ave.  
Yellowknife, NT.  
X1A 3S8  
Tel: 867-766-7300  
Fax: 867-766-7347

Attention: Dee McCallum, SHE Manager

The distribution list for this Spill Contingency Plan is found in Table 1.

Table 1 Spill Contingency Plan Distribution List

• Affiliation/Location	• Position	• Name
De Beers Canada Inc. Toronto, ON	Chief Executive Officer	Chantal Lavoie
De Beers Canada Inc. Snap Lake, NT De Beers Canada Inc. Yellowknife, NT	Snap Lake General Mine Manager	Brad Corrigan
De Beers Canada Inc. Snap Lake, NT	Snap Lake Site – Emergency Control Centre	Protective Services
De Beers Canada Inc. Yellowknife, NT	SHE Manager	Dee McCallum
De Beers Canada Inc. Yellowknife, NT	Permitting/Environmental Superintendent	Jason Ash
De Beers Canada Inc. Yellowknife, NT	Senior Environmental Coordinator	Gail Seto
Ekati Services Yellowknife, NT	Contractor	Bob Davies
Braden Burry Expediting Yellowknife, NT	Contractor	Gary Reid
Department of Indian and Northern Affairs Canada Yellowknife, NT	Resource Management Officer	Tracy Covey
Government of the NWT Yellowknife, NT	Environmental Protection Services	Harvey Gaukel
Environment Canada Yellowknife, NT	Environmental Protection	Dave Tilden
Department of Fisheries and Oceans Yellowknife, NT	Area Manager	Michael Hecimovich
Mackenzie Valley Land and Water Board Yellowknife, NT	Chair	Willard Hagen

## 1.0 INTRODUCTION

### 1.1 Background

De Beers Canada Inc. (De Beers) owns and operates the Snap Lake Mine located approximately 220 kilometres North-East of Yellowknife, Northwest Territories, 30 km South of MacKay Lake, and 100 km South of Lac de Gras where the Diavik Diamond Mine, and the Ekati Diamond Mine are located (Figure 1-1). The site is in a remote area accessible only by aircraft and a seasonal winter ice road.

An Environmental Assessment Report for the proposed mine (De Beers 2002) was completed and submitted to the Mackenzie Valley Environmental Impact Review Board (MVEIRB) in February 2002. MVEIRB in turn completed a review, and recommended that the Mine proceed subject to the implementation of measures to mitigate environmental impacts (MVEIRB 2003). MVEIRB's report was submitted to the Minister of Indian and Northern Affairs Canada in July 2003 and received Ministerial approval in October 2003. In 2004, De Beers received the necessary Water Licence, Land Use Permit, Land Leases, and Environmental Agreement to begin construction and operation of the Mine in May 2004.

The Snap Lake Mine is a diamond-bearing kimberlite dyke averaging 2.5 m thick and dipping between 11° and 15° to the northeast under Snap Lake, and extends approximately 2,500-m east/west and 2,000-m north/south providing a resource of 22.8 million tonnes. The kimberlite dyke is mined by underground mining methods at an average rate of 3,000 tonnes per day. Infrastructure associated with the underground mine is described in Figure 2 Snap Lake Site Plan.

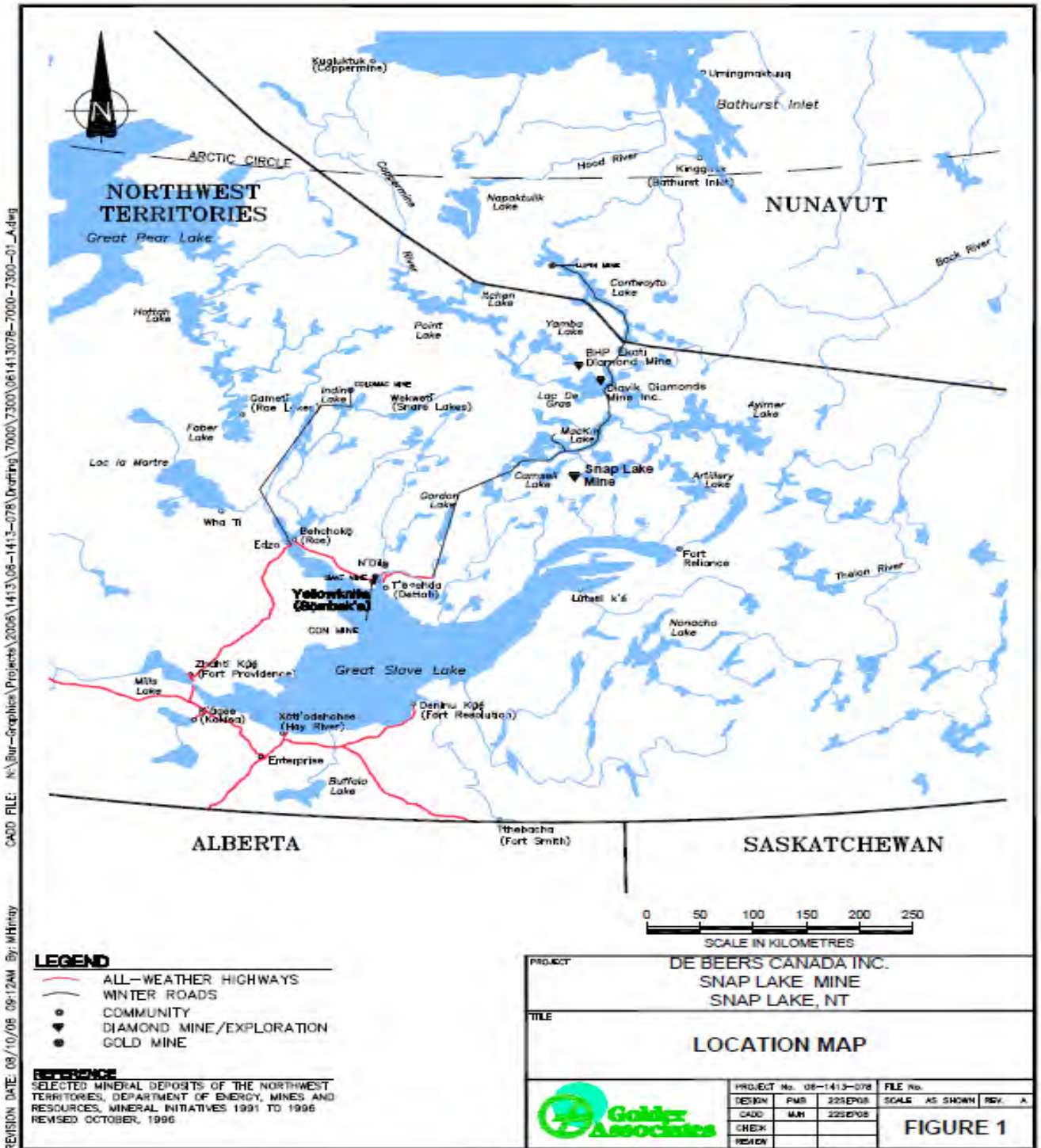


Figure 1 Location of Snap Lake Mine

## **1.2 DeBeers Environmental Policy**

De Beers is committed to the concept of sustainable development, which requires balancing responsible stewardship in the protection of human health and the natural environment with the need for economic growth. Diligence in the application of technically proven and economically feasible environmental protection measures will be exercised throughout exploration, mining, processing and decommissioning activities, to meet the requirements of legislation and to ensure the Company adopts best management practices. De Beers Safety, Health and Environmental (SHE) policy is to:

- assess, plan, construct and operate its facilities in compliance with all applicable legislation;
- provide for the protection of the environment, employees and the public;
- foster research directed at expanding scientific knowledge of the impact of the industry's activities on the environment, of environment/economy linkages and of improved treatment technologies;
- work proactively with government and the public in the development of equitable, cost effective and realistic laws for the protection of the environment; and
- enhance communications and understanding with government, employees and the public.

## **1.3 Purpose and Scope**

The purpose of this Spill Contingency Plan is to:

- Facilitate the prompt, efficient and safe clean-up of materials spilled during operation of the Snap Lake Mine;
- Identify the members, responsibilities and reporting procedures in the event of an emergency or spill; and
- Provide support and information on available resources, facilities and trained personnel in the event that a spill or an emergency occur.

This Spill Contingency Plan has been prepared in accordance with the Indian and Northern Affairs Canada's (INAC) "Guidelines for Spill Contingency Planning" (2007).

The Plan has been organized as follows:

Section 2 outlines the contact information, the response organization and reporting responsibilities. Training courses taken by spill response teams and an overview of spill response exercises for the response team is also included.

Section 3 provides information on De Beers' cleanup strategies to be followed for initial response actions and clean-up and a brief description of the major facilities found at the site that have the greatest potential to have a large or environmentally significant spill. Preventative measures to be taken to avoid environmental incidents at the mine site are also included. Basic emergency response actions and procedures are also presented.

Section 4 provides information on basic spill response theory and actions to be taken.

Section 5 provides a list of spill response equipment.

Section 6 provides a list of support documents used in preparation of this Plan.

Appendix A provides a summary of initial response actions together with detailed chemical and physical properties for each hazardous material used on site.

Appendix B provides a copy of the Government of NWT Spill Report Form.

Appendix C provides a copy of the Reportable Spill Volumes by type.

Appendix D provides a list of volumes of Hazardous Materials.



**Figure 2 Snap Lake Site Plan**

Of all the facilities at the site, those having the greatest potential for spills include the following:

- fuel storage and transfer systems;
- chemical and explosives storage and transfer systems;
- hazardous materials handling and storage facility;
- water treatment and management systems;
- sewage treatment system; and
- auxiliary systems (pipelines).

This Plan deals with the following types of materials that are handled on the Mine site:

1. Fuels, Oils, Lubricants and Coolants:
  - gasoline, diesel (P-50) and Jet B;
  - hydraulic, lube and waste oils; and
  - propylene and ethelene glycol.
2. Compressed Gases:
  - acetylene;
  - oxygen;
  - argon;
  - nitrogen; and
  - propane.
3. Explosives:
  - ammonium nitrate;
  - sodium nitrate; and
  - emulsion.
4. Process and Water Treatment Chemicals:
  - sulfuric acid;
  - ferric sulfate;
  - ferrosilicon;
  - aluminum sulfite; and
  - chlorine (sodium hypo-chlorite).
5. Effluents and Slurries:
  - raw and treated sewage;
  - process kimberlite (PK); and
  - mill process wastes and slurries.

Spill volumes beyond set limits require reporting to regulatory agencies in the NWT. These volumes are found in Appendix B, details on hazardous materials stored onsite can be found in Appendix D.

## 2.0 RESPONSE ORGANIZATION AND REPORTING PROCEDURES

### 2.1 Emergency/Spill Response Contact Information

Table 2 presents the names, positions and contact information for the Emergency Spill Response Team. Supplemental external contact information is also included here. Detailed responsibilities for each of the team members are provided in Section 2.2.

**Table 2 De Beers Snap Lake Emergency Spill Response Team – Contact Information**

<b>Spill Response Team Member Position</b>	<b>Name</b>	<b>Contact</b>
On-Scene Coordinator 2X2 <sup>1</sup> Rotation	Lex Lovatt Ron Messier	867 767-8536
Senior Environmental Coordinator 4X3 <sup>2</sup> Rotation	Gail Seto	867 767-8763
Environmental Technician 2X2 Rotation	André Boulanger Deborah Flemming	867 767-8533
Jr. Environmental Technician 2X2 Rotation	Guyline Gueguen Fred Kotchilea	867 767-8534
Environmental Consultant (External)	External Environmental Consultants would be used on as needed basis	
Support Personnel Both Rotations	Numerous on-site personnel are available to assist with spill and emergency response activities.	

<sup>1</sup> 2X2 rotation – the individual works 2 weeks onsite and has 2 weeks off.

<sup>2</sup> 4X3 rotation – the individual works onsite Monday – Friday.

<b>Administrative Team Member Position</b>	<b>Name</b>	<b>Contact</b>	
		<b>On Site</b>	<b>Off Site</b>
Permitting/Environmental Superintendent  4X3 Rotation	Jason Ash	867 767- 8626	cell: 867 444 9870
Safety, Health & Environmental Manager  4X3 Rotation	Dee McCallum	867 767- 8653	cell: 867 445-5784
Snap Lake General Mine Manager  4X3 Rotation	Brad Corrigan	867 767- 8698	cell: 867 445-8051
Chief Executive Officer  Mon - Fri	Chantal Lavoie	416 645- 1710	

## 2.2 External Contacts

A list of external contacts is provided in Table 3.

**Table 3 External Contact List**

Regulatory Agency	Name	24 Hour Contact #	
		Telephone	Fax
Government 24-Hour Spill Report Line		867-920-8130 867-920-5131 (24-hr pager #)	867-873-6924
Government of NWT	Environmental Protection Division, ENR	867-873-7564	
Indian & Northern Affairs Canada	District Manager, Operations, Yellowknife	867-669-2761	867-669-2720
Mackenzie Valley Land and Water Board	Willard Hagan, Chair	867-669-0506	867-873-6610
Environment Canada (24-hour pager)	Yellowknife	867-920-5131	867-873-8185

Supplemental external contacts are found in Table 4.

Table 4 Supplemental External Contact List

• CONTACT	• PHONE
<b>Government of the NWT</b>	
Harvey Gaukel, Environmental Protection Services, ENR	867-873-7654
Sylvester Wong, Director, Prevention Services, WCB	867-669-4408
Bernie Van Tighem, Office of the Fire Marshall	867-873-7469
<b>Federal Government</b>	
RCMP, Yellowknife	867-669-1111
Tracy Covey, Resource Management Inspector, INAC	867-669-2763
Dave Tilden, Environmental Canada	867-669-4700
Michael Hecimovich, Department of Fisheries and Oceans	867-669-4903
<b>Petro-Canada Emergency Response Mobile Unit</b>	
Mike Suchlandt, RTL (Yellowknife)	867-873-6271
Bob Wheaton, RTL (Enterprise)	867-874-3351
<b>Adjacent Mine Sites</b>	
BHP Ekati Mines Yellowknife	867-660-9292
BHP Ekati Mine Lac de Gras	867-880-2200
Diavik Diamond Mine Yellowknife	867-669-6500
Diavik Diamond Mine Lac de Gras	867-669-8866

### 2.3 Mobile Environmental Response Unit (Off-site)

Depending upon site access conditions, Petro-Canada's Emergency Response Mobile Unit is available on-call for incidents involving petrochemical products. The Unit is operated by RTL Trucking and can be reached at the information provided in Table 5.

Table 5 Mobile Environmental Response Unit Contact Information

• LOCATION	• CONTACT	• TELEPHONE
Yellowknife	Mike Suchlandt	(869) 873-6271
Enterprise	Bob Wheaton	(867) 984-3351

24-hour emergency support is also available from Petro-Canada at (403) 296-3000 (collect calls accepted).

## **2.4 Spill Emergency Response Team Member Responsibilities**

Detailed roles, responsibilities and reporting activities are provided below.

### **2.4.1 First Responders**

- Approach with caution
- Ensure the safety of all personnel (does anyone need help? If so, call for help).
- Secure the area, evacuate if necessary.
- Contact the On-Scene Coordinator.
- Remove all sources of ignition
- Provides basic spill response actions (stop or contain the leak, only if safe to do so).
- Initiate spill containment by first determining what will be affected by the spill
- Assess speed and direction of spill and cause of movement (water wind and slope)
- Determine the best location for containing the spill, avoiding any water bodies

### **2.4.2 On-Scene Coordinator**

- Controls the spill scene and directs the clean-up personnel.
- Evaluates the situation and assesses the magnitude of the problem.
- Activates the response plan and calls out the key personnel in the response team, as deemed appropriate (Environmental and/ or Emergency Response Coordinator).
- Develops the overall plan of action for containment and clean-up of the specific incident as well as directs and implements the plan.
- Determines the support needed for people, equipment, materials, and tools to control and/or contain the spill. The urgency will depend on the nature of the spill.

- Ensures assigned responsibilities are carried out and coordination exists between supervisory team members.
- Reviews the Incident Report with Team Members and Management.
- Ensures that all spill response personnel receive adequate training upon arrival to site to fulfill their responsibilities as part of the spill response team.

#### **2.4.3 Senior Environmental Coordinator**

- Supports the On-scene Coordinator
- Advises on the availability of various containment, recovery, and disposal equipment.
- Coordinates the sampling and monitoring program for the collection and analysis of samples to identify and monitor possible contaminant levels.
- Reports on the effectiveness of the clean-up and remediation activities.
- Reports the spill to the Mine General Manager.
- Calls the Permitting/Environmental Superintendent advice of situation.
- Calls the Environmental Technician, if required, (to take samples of impacted areas, photo-document situation, etc.).
- Calls the Environmental Consultant, if required, (provides overview of situation and requests specific advice on environmental actions to be taken such as sampling and monitoring).
- Reviews the draft Incident Report and provides comments, as necessary.
- Reports the spill to the NWT 24-hour spill report line at (867) 920-8130. Completes the NWT Spill Report Form (in Appendix B). The spill must be reported within 24 hours and the INAC inspector must be contacted immediately.
- Follows up with regulatory/licensing reporting requirements, as necessary.

#### **2.4.4 Environmental Technician**

- Supports the Environmental Coordinator.
- Takes samples, as directed.
- Takes photos of situation, as directed.

- Participates in Incident Review.

#### **2.4.5 Environmental Consultants**

- Supports the Environmental Coordinator on an as needed basis.
- Advises on the effectiveness of various containment, recovery, and disposal options, suggesting the most appropriate approach.
- Develops and/or recommends the sampling program to identify and monitor possible contaminant levels; suggests potential sample collection points and analytical requirements.
- Reviews the effectiveness of the clean-up operation and recommends further remedial work, if necessary.
- Provides technical advice on what the anticipated environmental impacts of the spill will likely be.
- Reviews the Incident Report and recommends suggestions to improve the response actions taken.

#### **2.4.6 Support Personnel**

- Snap Lake Mine may have between 300 and 400 personnel, with a multitude of skill sets, onsite depending on current activities. If required a number of these personnel could be used to aid in spill clean up.

### **2.5 Management, Administrative and Technical Support**

#### **2.5.1 Permitting/Environmental Superintendent and or Safety, Health & Environmental Manager**

- Is advised of the spill situation, determines if additional support is needed.
- In the event of a major spill, may assist with on-site coordination of technical and administrative activities.
- Reviews the Incident Report.
- Provides follow-up with regulatory/licensing reporting requirements.

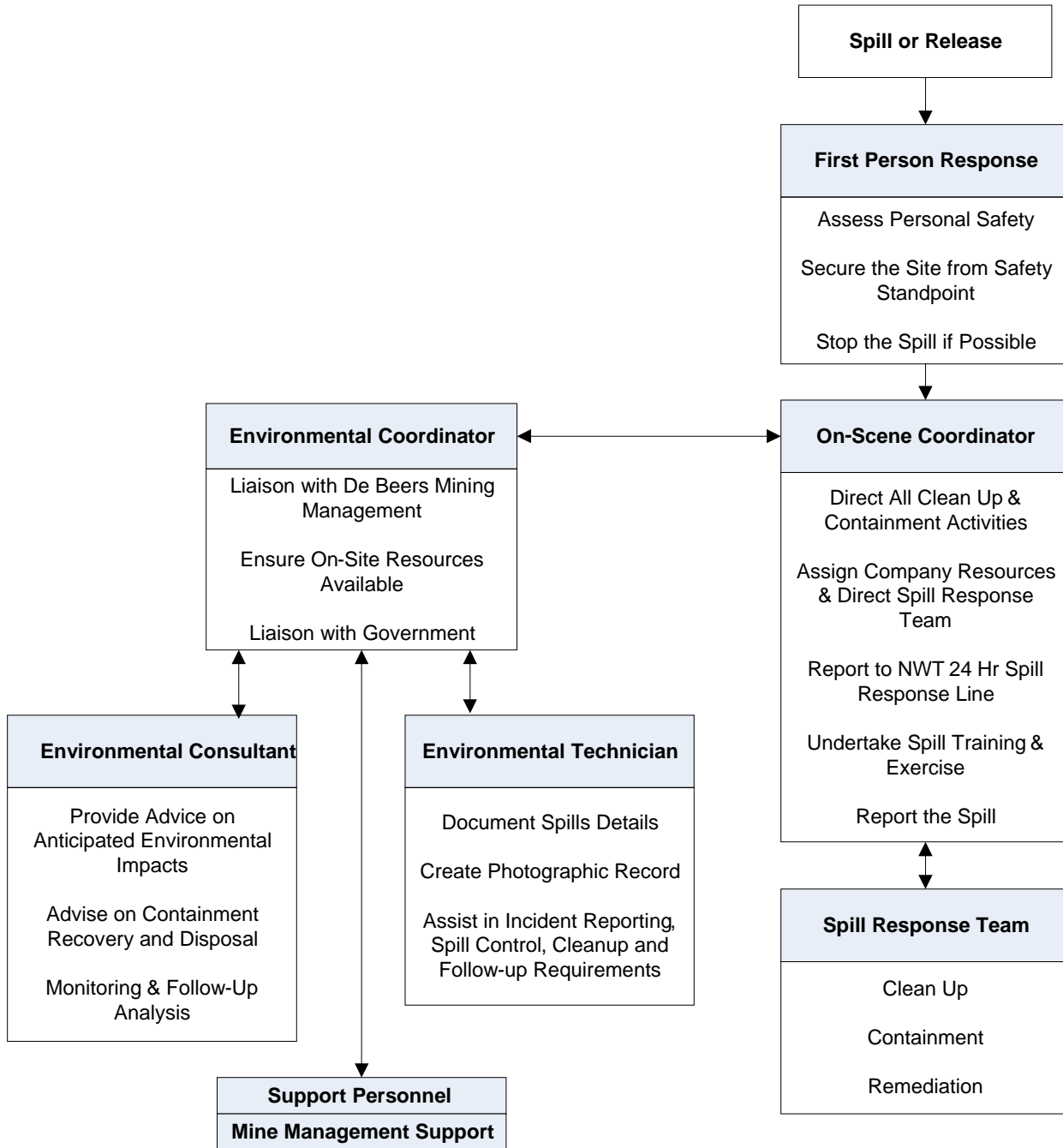
### **2.5.2 Snap Lake General Mine Manager**

- Ensures adequate resources are made available to support the needs of the spill team.
- Determines if the mining operations can continue in a safe manner.
- Coordinates support activities with the Designated Snap Lake Operations Team, including but not limited to:
- Obtaining any additional resources not available on-site for spill response and clean-up (e.g., the Petro-Canada Spill Response Vehicle, etc.)
- Advises the Director, External and Corporate Affairs and Chief Executive Officer of the spill and provides updates, as necessary.
- Reviews the Incident Report.

### **2.5.3 Chief Executive Officer**

- Is advised of the spill situation, determines if additional corporate support is needed.
- In the event of a major spill will advise other Corporate Officers of the clean-up activities.
- Reviews the Incident Report.
- If required, will act as the spokesperson for the media/stakeholders.

**Figure 3 Spill Response Team Member Basic Responsibilities**



## **2.6 Training**

The employee and contractor training program was developed by the manager of Safety, Health and the Environment and has been disseminated through the Site Orientation requirements. The following are key steps in the program:

- All individuals entering the site are required to participate in a site orientation session
- During this session, all locations of the spill plan and spill kits are provided on a map in a hard copy
- An overview of the spill plan is provided through a SHE-Ops training module
- A database of training is kept by the Head office indicating specific training undertaken and expiry dates of this training e.g. First aid. It is regularly updated.

### **2.6.1 Spill Response Training**

All members of the designated Emergency/Spill Response Team (ERT) have current Spill Response Training (as discussed in Section 2.5.2 of this Plan). Regular training is provided by recognized training personnel.

The ERT is trained to respond to spills, be aware of the dangers the spill presents and how to respond in a safe manner. The use and availability of Personnel Protective Equipment (PPE) by all ERT and mine/mill personnel is mandatory. Typical PPE includes work boots, hardhat, coveralls, neoprene gloves, goggles, face shield and chemical/dust respirators, as appropriate.

By taking the time to create spill response scenarios and holding regular drills, spill responders can be kept safe during response and minimize harm to the environment.

All personnel and contractors at the Mine site are familiar with spill reporting requirements and are encouraged to constantly check for leaks and spills. Refresher ERT training is to be conducted annually.

Contractors are trained for Workplace Hazardous Materials Information System (WHMIS), Transportation of Dangerous Goods (TDG), Hazardous Atmospheres and Confined Space Entry, as required. Contractors will also

provide support to De Beers for major spill response activities, upon request. They are responsible for cleanup of their own spills at their specific job-sites.

Fuel handling crews are to be fully trained in the safe operation of the facilities, spill prevention techniques and initial spill response. Similarly, the staff involved with the process, tailings and wastewater systems are trained in the safe operation of these systems.

Training programs include regular WHMIS and TDG training for all employees who use or are responsible for chemicals or hazardous materials on-site. Additional safe chemical handling training will be conducted for employees handling or working in the vicinity of dangerous chemicals. This includes Spill Response, Self-Contained Breathing Apparatus (SCBA) and Confined Space Entry.

Completion dates of all training taken will be recorded and tracked, and re-training will occur annually or as required by the specific course. Any other training such as First Aid, Rescue, Fire Fighting, etc. will also be tracked.

ERT members receive training in the following courses:

- On-Scene Spill Commander Course; and
- Spill Responder (First Responder).

The ERT must be very familiar with:

- a review of the most current spill response plan;
- emergency contact lists;
- responsibilities of the team members;
- the nature, status, and location of fuel and chemical storage facilities (Figure 3);
- the on-site and off-site spill response equipment;
- response procedures for specific types of spills (Appendix A);
- the spill response procedures for 'on land', 'oil on water', 'boat handling' and 'winter spills';
- desktop exercises of "worst case" scenarios;
- the likely causes and possible effects of spills; and

- other De Beers emergency response plans, as required (e.g., fires, explosions, injuries, non-mine rescue, etc.).

All instructors will be qualified in spill response and prevention methods.

### **2.6.2 Emergency/Spill Exercise**

De Beers conduct regular emergency/spill exercises to test the response capabilities of the Emergency/Spill Response Team. The exercises are geared to spills, system failures and other emergencies. Depending upon the material, spill exercises may be conducted several times per year. Actual spill responses are counted towards the exercise requirements for that material.

A report is made by the On-Scene Coordinator noting the response time, personnel involved and any problems or deficiencies encountered. This report is used to evaluate the ability of personnel to respond to spills and to identify areas of improvement

### 3.0 CLEAN UP STRATEGIES

The Snap Lake Mine is located in the Slave Geological Province of the Canadian Shield. The site is characterized by numerous lakes and rocky hills of limited relief (up to 50 metres) situated on the Northwest Peninsula of Snap Lake. The land is covered with extensive bedrock outcrops and muskeg in low-lying areas. The site is located in a zone of permafrost.

De Beers has taken extra precautions to include in their design of the site:

- double walled piping;
- lined berms in fuel transfer areas;
- liquid storage with secondary containment or berms where spills are trapped for easy clean-up;
- drip mats or absorbent pads under fittings, valves, hose connections, drum spigots where spills and leaks occur;
- use of funnels and a drip mat or pan when transferring liquids from one container to another;
- use of tarps or ground cloths; and
- spill kits are located wherever fuel is used or stored
- product substitution so that products contain the least toxic materials possible.
  
- regular maintenance and oil checks of all motorized vehicles are also undertaken to avoid preventable leaks

Pollution prevention is the best strategy for avoiding potential damage to human health and the environment. However, once a spill occurs, the best approach for containing and controlling the spill is to respond quickly in a well-organized manner. A response will be quick and organized if response measures have been planned ahead of time.

Spill kits, emergency response signs, emergency use telephones, first aid kits and fire alarms are strategically located throughout the entire mine site complex to allow staff to quickly and safely respond to any type of emergency, spills included.

As hydrocarbons will be the most likely of all products to spill at the site, natural processes such as evaporation, oxidation, and biodegradation can start the clean-up process. However, they are generally too slow to provide adequate environmental

recovery. Physical methods such as the use of a vacuum truck and or wiping with sorbent materials will be used. Pressure washing, and raking and bulldozing may be used to assist these natural processes depending on the sensitivity of the impacted area.

The smaller volumes of contaminated soils encountered in the initial stages of the Mine will be managed in accordance with industry best practice and regulatory requirements. If contaminated soil is identified, the nature of the contamination will be established and the remediation or disposal options confirmed prior to removal of the soil from the site. All wastes will be promptly cleaned up, stored in marked containers, and moved to the Hazardous Waste Cell within the Waste Management Area before final disposal at an approved off-site treatment and disposal facility. Soil sampling will be conducted in larger impacted areas to ensure that clean up activities are satisfactory. Petroleum-contaminated snow will be recovered and stored for later disposal.

A land farm was constructed to handle larger volumes of bio-degradable contaminated soils. The land farm will not treat liquids so birds or other waterfowl deterrents will not be necessary.

### **3.1 Fuel System**

Diesel, gasoline, Jet B and hydraulic fluid may be harmful to water and aquatic life. They are not readily biodegradable and have the potential for bioaccumulation in the environment. They volatilize relatively quickly and exposure to the environment should be avoided.

Refer to Spill Response Action Sheets (in Appendix A) for diesel (P-50), gasoline, Jet B, and, hydraulic oil, lube oil and waste oil.

In the event of a large or environmentally significant spill, a sampling program for the collection and analysis of soil and/or water samples to identify and monitor possible contaminant levels would be developed with the advice of the Environmental Consultant. The sampling program will be “spill-specific”.

The main fuel storage facility is made up of twelve (12) steel single-wall tanks each containing approximately 330,000 litres of diesel fuel (P-50); the permanent fuel tank farm consists of three (3) 12.78 million litre steel single-wall tanks, and there are six (6) steel single-wall tanks each containing 500,000 litres of diesel fuel (P-50). These tanks are filled to capacity during the winter ice haul road programmes. The tank areas are lined and bermed. Additionally, there are a number of double-wall fuel storage tanks situated throughout the mine site. Fuel transfer to these tanks is by fuel truck.

Fuel transfer lines run between the main fuel storage facility and the Powerhouse, the Process Plant, the shops, Warehouse and Accommodation Complex.

Vehicles and equipment will obtain fuel either at pump stations or fuel service trucks. Fuelling is conducted in controlled areas. Fuel containers (including drums) are marked with the product type and organized according to a 'first in-first out' strategy.

Fuel, specialty chemicals and most lube oils normally arrive by tanker truck via the winter road; however on occasion may also arrive by air. Federal TDG aviation regulations apply during air shipments. Upon arrival, these materials are moved by forklift to a designated storage area.

A vehicle containing approximately 2 cubic meters of aircraft de-icing fluids (propylene glycol based) is situated at the airstrip. Approximately 4 cubic meters of additional de-icing fluid is kept in inventory and is stored in 205 litre drums within a lined containment area at the airstrip apron. Quantities of other glycols for use in heating / cooling systems are also kept in inventory and are stored in 205 litre drums and/or 1000 litre totes within a designated storage area.

Spill kits are located at all areas where fuel, glycol, and chemicals are stored and/or dispensed.

### **3.1.1 Fuel Storage and Transfer System - Spill Preventative Measures**

Fuel spills could occur from:

- leaks in storage;
- transfer between fuel storage and vehicles;

- transfer between tanks;
- broken pipes, leaking hoses or nozzles used at transfer facilities and pumping stations;
- fuel transfer vehicle or equipment accidents and roll-overs;
- helicopter fuel slinging; and
- operator error

The following procedures will reduce the risks of spills and equipment failure:

- scheduled inspection and maintenance of all fuel related systems;
- double locking mechanisms on valves and transfer hoses and spring-loaded valves on loading nozzles;
- careful measurement of fuel levels in tanks (particularly when transferring fuel);
- scheduled testing of fuel level devices and alarms in tanks (once every 2 months);
- Hydrostatic or equivalent testing of bulk fuel storage tanks is conducted regularly?
- fuel is distributed by service vehicles with small capacity tanks;
- service vehicles are equipped with spill kits;
- training in fuel handling operations (manned at all times);
- spill response training;
- restricted access to the fuel storage and handling areas;
- strategic placement of spill kits;
- use of absorbent pads during all vehicle and all operating machinery maintenance activities;
- maintaining a supply of 'over-pack' drums for any leaking drums;
- maintaining a supply of empty drums for storage of spilled materials;
- immediate cleanup of all spills; and
- the decanting of snow or water from the tank bermed areas will proceed only when chemical analysis has determined the contents meet the requirements of Section 36.3 of the *Fisheries Act*.

### **3.2 Chemical and Explosives Storage and Transfer Systems**

Corrosives (sulphuric acid, ferric sulphates) are contained in steel-caged reinforced poly-cubes (totes) and range in size from 500 to 1000 litres. They are stored in the granite lay-down area gravel pad beside the Water Treatment Plant.

Caustic substances (sodium hydroxide) are stored on a gravel pad at Laydown 1. These are contained in 1000 litres steel-caged reinforced poly-cubes (totes).

Explosives include ANFO in bulk and packaged emulsions are stored at the emulsion plant and/or at the mine in secure facilities designed for that purpose. Various compressed gases (e.g., acetylene) are not expected in large quantities.

Personnel dealing with these substances will be limited to selectively trained staff. Personnel shall be trained regularly in handling, storage and spill prevention procedures. Spill exercises will be conducted on a regular basis.

#### **3.2.1 Chemical and Explosives Storage and Transfer System - Spill Preventative Measures**

Chemical spills and explosives incidents could occur from:

- leaks in storage;
- transfer between chemical storage and work areas;
- transfer between tanks;
- broken pipes, hoses or nozzles in transfer facilities and at pumping stations;
- vehicle or equipment accidents or roll-overs;
- sources of ignition for the explosives; and
- operator error.

The following mechanisms will reduce the risks of spills and equipment failure:

- secondary containment around all tanks, totes and barrels;

- double-locking mechanisms on valves and transfer hoses and spring-loaded valves on loading nozzles;
- restricted and locked access to the chemical or explosives areas; and
- smaller pressurized bottles/bullets will be stored in appropriate containers in the vertical and upright position and chained to prevent unexpected falling over. Protective caps will be used when not in service.

The following procedures will reduce the risks of spills and equipment failure:

- scheduled inspection and maintenance of all chemical related systems;
- careful measurement of levels in tanks (particularly when transferring chemicals);
- training in chemical handling operations (manned at all times); and
- the decanting of snow or water from the tank bermed areas will proceed only when chemical analysis has determined the contents meet the requirements of Section 36.3 of the *Fisheries Act*.

The following procedures will reduce the effects of spills:

- strategic placement of spill kits, absorbent pads and neutralizing agents;
- maintaining a supply of empty drums for storage of spilled materials;
- spill response training; and
- immediate cleanup of all spills

### **3.2.2 Chemical and Explosives System – Spill Response Actions**

- Refer to Spill Response Action Sheets (in Appendix A) for sulphuric acid, ferric sulphate, sodium hydroxide, ammonium nitrate, sodium nitrate, and ANFO.
- In the event of a spill, safety measures will be implemented whereby personnel will be removed from the area of the spill until the spill is contained. Suitable personnel protective equipment (PPE) must be used by the first and all subsequent spill responders.

- Vapours cannot be contained when released. If pressurized tanks are damaged, the gas shall be allowed to disperse and no attempt at recovery will be made. Evacuation of the area will be mandatory.
- When a spill of an oxidizing substance such as ammonium nitrate occurs, spills on land shall be contained by dyking or some other barrier, as required. As ammonium nitrate is water soluble, spills in water may be dammed or diverted, as appropriate.
- Corrosive materials will be neutralized with lime and/or soda ash prior to containment.
- Only those personnel specifically trained to handle explosives will be allowed to deal with those types of spills, all unauthorized personnel will be evacuated from the spill area.
- In the event of a large or environmentally significant spill, a sampling program for the collection and analysis of soil and/ or water samples to identify and monitor possible contaminant levels would be developed.

### **3.3 Hazardous Materials Handling and Storage Facility**

De Beers has developed and implemented a Hazardous Materials Management Plan (De Beers 2010). Information on classification, transportation, handling, disposal, inspections, record keeping and training are found within this referenced document. Information on how to deal with spills of these hazardous materials is found within the Spill Contingency Plan (this document).

Potential soil and groundwater impacts may result from spills, leaks, and runoff from hazardous materials storage areas. Spills may occur during material handling and storage.

Hazardous materials include both flammable and non-flammable petroleum products (e.g., gasoline, aviation fuel, diesel, solvents, paints, oils and greases), ethylene glycol, process chemicals (e.g., acids and flocculants) and water treatment chemicals (e.g., sulphuric acid and sodium hypo-chlorite), explosives and compressed gases (e.g., propane, acetylene and oxygen).

All containers will be labelled according to the requirements of the WHMIS System.

Only persons authorized to enter this facility will have access. These individuals will be trained in waste handling procedures.

The Snap Lake ERT will be informed of the types of hazardous materials located in the facility. Inventories will be conducted on a regular basis or as materials are added or removed. The ERT will be trained in emergency response procedures and will conduct drills and other training exercises on a regular basis.

### **3.3.1 Hazardous Materials Storage Facility – Spill Preventative Measures**

Hazardous materials spills and related incidents could occur from:

- leaks in storage;
- transfer between storage and work areas;
- transfer between tanks;
- mixing of incompatible materials (e.g., acids with bases);
- broken pipes, hoses or nozzles in transfer facilities and at pumping stations;
- vehicle or equipment accidents or roll-overs;
- sources of ignition close to flammable or explosive materials; and
- operator error

The following mechanisms will reduce the risks of spills and equipment failure:

- secondary containment around all tanks, totes and barrels;
- double-locking mechanisms on valves and transfer hoses and spring-loaded valves on loading nozzles;
- restricted and locked access to the hazardous materials areas; and
- smaller pressurized bottles/bullets will be stored in appropriate containers in the vertical and upright position and chained to prevent unexpected falling over. Protective caps will be used when not in service.

The following procedures will reduce the risks of spills and equipment failure:

- scheduled inspection and maintenance of all hazardous materials related systems;

- careful measurement of levels in tanks (particularly when transferring hazardous materials);
- training in hazardous materials handling operations (manned at all times); and
- the decanting of snow or water from the tank bermed areas will proceed only when chemical analysis has determined the contents meet the requirements of Section 36.3 of the *Fisheries Act*.

The following procedures will reduce the effects of spills:

- strategic placement of spill kits, absorbent pads and neutralizing agents;
- maintaining a supply of empty drums for storage of spilled materials;
- spill response training; and
- immediate cleanup of all spills

### **3.3.2 Hazardous Materials Storage Facility – Spill Response Actions**

- **Refer to Spill Response Action Sheets (in Appendix A)** for the hazardous material that has spilled (they are all located within this document).
- In the event of a spill, safety measures will be implemented whereby personnel will be removed from the area of the spill until the spill is contained. Suitable personnel protective equipment (PPE) must be used by the first and all subsequent spill responders.
- Vapours cannot be contained when released. If pressurized tanks are damaged, the gas shall be allowed to disperse and no attempt at recovery will be made. Evacuation of the area will be mandatory. Select ERT members will don SCBA PPE as a precautionary measure only if they will be going to the leaking container to facilitate stopping the leak or some other purpose.
- When a spill of an oxidizing substance such as ammonium nitrate occurs, spills on land shall be contained by dyking or some other barrier, as required. As ammonium nitrate is water soluble, spills in water may be dammed or diverted, as appropriate.
- Corrosive materials will be neutralized with lime and/or soda ash prior to containment.

- Only those personnel specifically trained to handle hazardous materials will be allowed to deal with those types of spills, all unauthorized personnel will be evacuated from the spill area.
- In the event of a large or environmentally significant spill, a sampling program for the collection and analysis of soil and or water samples to identify and monitor possible contaminant levels would be developed. The sampling program will be “spill-specific”.

### **3.4 Water and Waste Water Treatment and Associated Management Systems**

The Snap Lake Water Treatment and Management System include a Water Treatment Plant (WTP), Temporary Water Treatment Plant (TWTP), Water Management Pond (WMP), Sewage Treatment Plants (SBR's and MBR's), and a potable Water Treatment Plant. Each of these major components is addressed in this Spill Contingency Plan.

#### **3.4.1 Water Treatment Plant**

The WTP facility consists of decant water-feed and a bank of twelve (12) filtration units which was constructed in 2007. Sulphuric acid is used for pH control and to reduce ammonia toxicity. Excess filtered water will be released to Snap Lake provided it meets discharge criteria. This WTP is located in the Utilities building. The current capacity of this facility is up to 35,000 m<sup>3</sup> per day.

The Temporary water treatment plant TWTP consists of a temporary portable (trailer mounted) filtration plant which was constructed in 2004. It is expected to provide contingency support during periods of downtime at the permanent water treatment plant (WTP). The current capacity of this facility is up to 10,000 m<sup>3</sup> per day. It can also be used concurrently with the WTP to increase the daily process rate, should the need arise.

The potable Water Treatment Plant consists of a series of filtration and disinfection units that supply clean, safe drinking water to the campsite and mine site offices and buildings. The raw water is withdrawn from Snap Lake via a pumphouse situated northeast of the campsite. The water is first filtered with both sand and bag filters, followed by UV disinfection and lastly sodium hypochlorite is added to maintain a chlorine residual of 0.2 to 0.5 mg/l, as required by health authorities. This facility typically treats approximately 150 – 250 m<sup>3</sup>/day.

### **3.4.2 Water Treatment Plant – Spill Preventative Measures**

System failures may occur due to pipe blockage, electrical power outage, equipment malfunctions, or foreign objects or material in the influent. Spills may occur due to pipe rupture or control system failure and overflow. Degradation of effluent quality may also result from equipment malfunction or operational error.

A high and low level alarm system is installed on the tanks in the WTP and the alarms are tripped in the Utilities Control Room as well as the Process Control Room to provide immediate notice of system failure. Both Control Rooms are manned continuously so all alarms are dealt with expeditiously. The camp emergency electrical power generator will be used in the case of failure of the main site generators.

Chemicals used in the water treatment process are contained within tanks positioned inside concrete dykes designed for that purpose. Further, trained WTP operators conduct visual inspections twice per day.

A regularly scheduled preventative maintenance program is in place.

### **3.4.3 Water Treatment Plant – Response Actions for Non-Compliant Effluent**

- Effluent will be sampled and analyzed continuously by in-line monitoring for flow, temperature, pH, conductivity and turbidity.
- On-site measurements for total suspended solids, ammonia, temperature and turbidity will be conducted. Additional samples for laboratory analysis will be collected until effluent quality is satisfactory (usually following major adjustments to the WTP). The sampling frequency will be dependent upon the nature and severity of the problem.
- If the water quality does not fall within the acceptable pH and turbidity range, the plant will automatically bypass to the WMP.
- An alarm will automatically sound in the Water Treatment Plant Control Room which will, in turn, alert the appropriate personnel to check the plant in the event of a malfunction.

### **3.4.4 Water Management Pond**

The WMP was created by two dams that were constructed in 2000. The WMP receives water from the catchment area, North Pile sumps, and excess mine water and/or water from the WTP that do not meet the discharge criteria. Additionally, the WMP will be used as a contingency in the event that the sewage treatment plant(s) (SBR's and MBR's) cannot meet discharge criteria. The dams consist of a rock fill embankment supporting an 80 mil textured HDPE liner on the upstream side. The liner is keyed into the underlying intact bedrock (using a mixture of sand and powdered bentonite) and compacted into a key trench to minimize the seepage beneath the dams. Suitable granular bedding and cover layers were placed on either side of the liners. As-built reports were submitted to the Mackenzie Valley Land and Water Board as required under the Snap Lake Class 'A' Water License MV2001L2-0002. Small seepage losses are expected to occur.

### **3.4.5 Water Management Pond – System Failure Preventative Measures**

Routine monthly and yearly visual inspections and elevation surveys of the dams are conducted. In addition, daily/weekly/monthly monitoring of the inflow from the underground workings, site weather conditions and WMP water levels are recorded.

Weekly inspections of the upstream face, crest and downstream face of the dams are carried out to identify water levels relative to the crest, erosional features, and displaced or eroded rip rap, sinkholes, or visible seepage, tears in the liner or cracks in the dam structure.

Standpipe piezometers and thermistors are installed adjacent to and within both dams. During ice-free conditions, the piezometers are read at least monthly. Thermistors are read at least monthly year round.

The WMP is surveyed for vertical settlement using a builder's level and augmented with periodic surveys of ice elevation during the winter months.

An annual geotechnical inspection is undertaken by geotechnical engineers during ice-free conditions and consists of the following tasks:

- walking visual inspection of the crest, upstream and downstream sides, followed by an inspection of the toe area for seepage;

- review of instrumentation data collected to monitor the performance of the dams;
- review of site-specific weather information, including monthly temperature and precipitation values;
- review of processed kimberlite tonnages and water volumes disposed within the facility; and
- preparation of a report outlining physical conditions and recommendations for maintenance and additional monitoring.

The capacity of the WMP and associated freeboard allowances were established as part of the approved design. The original water balance calculations for the design were based on the assumed site conditions and operating parameters for the Advanced Exploration Program (AEP). Daily records of all measurable inflows to the WMP are maintained by site personnel.

Water quality sampling of inflows and water stored in the WMP is ongoing.

Appropriate remedial measures will be developed in consultation with the geotechnical engineers if:

- unusual changes or damage are seen in the WMP dams during routine or annual inspections; and
- significant water balance discrepancies are noted during data reviews.

Remedial measures could include repair of erosion areas, re-leveling subsidence of the dam crest, placement of seepage barriers, or stabilization of the toe berms.

### **3.4.6 Water Management Pond – System Failure Response Actions**

WMP maintenance preparations may include:

- stockpile dam construction materials for repairs;
- have adequate supplies of geo-composite liners for emergency repairs (e.g., bentomat) and bagged bentonite to seal minor leaks; and
- maintain a list of earth-moving equipment on-site to move fill materials to where they may be needed.

Following consultation with geotechnical engineers, the following actions may be taken immediately prior to a major system failure (i.e., instability or water holding capacity concerns):

- test water quality and initiate treatment of WMP seepage water to ensure its acceptability for release;
- pump and glaciare water, during freezing conditions, within the WMP basin; or
- cease underground operations (temporarily) and draw down the WMP by flooding the underground workings (only when it is safe to do so).

In the event that capacity problems in the WMP are encountered, the dam crests could be raised to a safe level/elevation.

To control seepage from the WMP, the dams were constructed with impermeable HDPE liners that are tied to intact bedrock. The liners minimize seepage by preventing seepage through the dams. Hydrostatic pressure from water in the WMP results in a small amount of seepage through the bedrock in the pre-existing talik (unfrozen ground) underneath Dam 1. Dam 2 is constructed completely in permafrost and no seepage is expected to occur underneath this dam. In the "Reasons for Decision" for the Water License for the Snap Lake Mine, the MVLWB made the following statement (Part D, Item 3):

*The Board recognizes that a relatively small amount of seepage (from the WMP) may occur via bedrock fractures. While not approving of it, the Board understands that the volumes and concentrations of such waste will be minor and there should be no impact to the receiving environment. Any seepage exiting the WMP via bedrock fractures is likely to be free of processed kimberlite solids and of quality comparable to that of the effluent from the Water Treatment Plant (WTP, one of whose primary functions is the removal of processed kimberlite solids. The Board also recognizes that DBCMI is responsible to manage and control these seepages.*

The quality and quantity of seepage from the WMP through dams 1 and 2 are monitored. The current estimate of seepage under Dam 1 is 17 m<sup>3</sup>/day (at full supply level) based on piezometer monitoring results and two-dimensional groundwater flow modeling. The Environmental Assessment (De Beers 2002) assessed the effects of 33 m<sup>3</sup>/day of seepage from Dam 1 entering Snap Lake and determined that the effect on water quality and aquatic life

would be negligible. The seepage volume from Dam 1 will be updated annually. If the updated seepage rate exceeds the rate assessed in the Environmental Assessment ( $m^3/day$ ), then the potential for effects to Snap Lake will be re-evaluated and potential mitigation measures identified.

If signs of an impending failure are detected, the dam and downstream areas will be evacuated. An urgent request for advice from the geotechnical engineers would also be undertaken. In the event that rockfill or other granular materials are needed in an urgent manner, permission from the regulatory agencies will be sought.

Under serious yet manageable operating conditions, steps would be undertaken to conduct an emergency discharge. Time permitting, regulatory approvals will be obtained. However, if a catastrophic failure or release is imminent, the water will be discharged and the regulators will be notified.

Rehabilitation of any failure area would include steps to contain and/or recover released processed kimberlite (PK) and return it to the WMP. All remedial activities would be specified by the geotechnical engineer and/or an Environmental Consultant, as needed.

As information becomes available in the future, De Beers is committed to compiling physical and chemical data on PK. This information will be used to prepare specific spill response action plans, as appropriate.

However, in the event of a PK spill or release to Snap Lake, attempts will be made to contain and recover as much of the spilled material as possible. A 'spill-specific' sampling and monitoring program will be established and implemented.

### **3.5 Sewage Treatment System**

The sewage treatment system consists of sequencing batch reactors (SBR) and membrane biological reactors (MBR). Solids are land filled.

System failures and/or spills may occur due to pipe blockage, electrical power outage, equipment malfunctions, operator error or foreign objects or material in the influent, which cannot be processed by the SBRs or MBRs.

### 3.5.1 Sewage Treatment System – Spill Preventative Measures

At the Snap Lake mine site, STP effluent is currently directed to the WTP and discharged directly to Snap Lake. Sewage treatment plants can and do malfunction as the result of human error, breakage of equipment, or unusual conditions in the raw sewage. Under upset conditions, discharge of raw or partially treated sewage would be directed into the water management pond (WMP) to provide tertiary treatment prior to reaching Snap Lake.

Visual inspections of the STPs are carried out daily. An alarm system is installed in the camp complex to provide immediate notice of system failure. If the main mine site electrical generators fail, the camp emergency power generator will be used.

Trained personnel, whose responsibilities are dedicated to operating the STPs, will ensure that the facilities are monitored on a consistent basis and will respond to non-compliances in a timely manner. Response measures may include:

- Adjustment to the system would be made in consultation with the manufacturer's technical expert.
- Unfavourable sampling trends will be evaluated on a case by case basis. The sampling frequency will be based upon the nature and severity of the problem.
- If the non-compliance trend continues whereby the operators are unable to bring the plant back on line within a timely manner, action will be implemented to have the technical representative brought to site to assist the operators.
- Technical assistance from the manufacturer is available, by agreement, on a 24-hour, 7 day a week basis.
- Technical assistance and equipment from the manufacturer can be mobilized to site on 24-hour notice should repair, replacement or adjustments be necessary.
- Spare parts for certain system components are available on site in case of equipment failure.

### **3.5.2 Sewage Treatment Plant – Spill Response Actions**

Refer to Spill Response Action Sheet for Raw Sewage should a spill occur (in Appendix A).

Spills of partially treated or untreated sewage that occur inside the plants would involve:

- the removal of spilled materials (spills of untreated waste will be contained using a vacuum truck and necessary spill cleanup materials and re-routed to the front end of the system);
- site sanitation (by spreading hydrated lime over the area);
- treatment of recovered sewage and any materials contaminated with sewage by incineration; and
- decontamination of workers.

### **3.6 Auxiliary Systems (Pipelines)**

A line break or malfunction along any of the pipeline systems could be caused from:

- being struck by construction equipment;
- internal corrosion;
- uneven settlement along the line (frost or permafrost heave); and
- poor materials or workmanship during installation.

#### **3.6.1 System Components (Pipelines) – Spill Prevention**

Spills can be prevented by implementing the following precautions:

- marking the locations of all overhead or buried lines;
- locating lines in non-permafrost areas;
- ensuring all departments and/or contractors are aware of all buried and overhead lines in their work areas;
- monitoring the flows and pressures in the lines;
- inspecting, maintaining and repairing the lines and related pumps, etc.;
- using cathodic protection systems for metal lines; and

- installing lines in non-permafrost areas.

The following water pipeline inspection checks are carried out by Site Services:

- the STP inflow line;
- the STP outfall pipe;
- WTP to the WMP;
- WTP to Snap Lake; and
- the mine portal to the WTP.

### **3.6.2 System Components (Pipelines) – Spill Response**

Refer to the Spill Response Action Sheets for the specific chemical spill (in Appendix A).

The mine operational plan for a pipeline failure would be to:

- shutdown the line;
- contain and cleanup the spill;
- repair or replace the line;
- reconnect and test the line; and
- resume operations.

In the event of a spill, the On-Scene Coordinator will initiate the process of shutdown and the ERT will be deployed. Immediate action to reduce and minimize impacts to the tundra and adjacent water bodies is required. Spill containment and recovery of the spilled material will be a priority. Personnel safety is first.

Any material that has escaped from the pipelines and deposited on the surrounding ground would be recovered and disposed of in containment drums or, if the volume is significant, in the WMP. Crushed gravel and/or stockpiled esker material would be used to re-contour the area to original ground elevation.

Any PK tailings or sediment slurry that has escaped from the system to a water body would be left in place until further advice has been received on the cleanup from an Environmental Consultant.

In the event of a PK spill or release to Snap Lake, attempts will be made to contain and recover as much of the spilled material as possible. A 'spill-specific' sampling and monitoring program will be established and implemented.

If a minewater spill should occur, the faulty component(s) would be identified and repaired or replaced where necessary. Any spilled material would be cleaned up and disposed of into the WMP.

## 4.0 SPILL RESPONSE ACTION PLANS

### 4.1 Spill Response Theory

#### 4.1.1 Planning

Knowing what to do when spills happen is essential to employee safety as well as minimizing harm to the environment. Planning, training and drills are vital to ensuring everyone knows what to do and when to do it when an emergency arises.

#### 4.1.2 Basic Procedures

The following steps are taken during any spill response:

- **Assess Spill Hazards and Risks:** the ERT are trained to not endanger them in order to identify a spilled material.
- **Notify Site Management:** this is required any time a spill is observed or when a spill cannot be identified (no matter the volume), any time a spill cannot be identified or when the spill response team will be needed. By notifying the proper people, efforts can be coordinated and initiated.
- **Protect responders:** when a spill has been properly identified, appropriate personal protective equipment is available to handle the hazardous materials on site and is stored in the ERT building. Ensuring the safety of the response team is critical.
- **Review Material Safety Data Sheets (MSDSs):** MSDS are used to determine the necessary PPE required for a response to spill situations (e.g., protective suits, boots, gloves, respiratory protection, detection equipment and monitors, etc.).
- **Refer to Spill Response Action Sheets found in Appendix A.**
- **Check operating systems, spill response equipment and PPE,** on a regular basis.
- **Tend to injured personnel:** personal safety is the highest priority. Attending to injured personnel in the spill area is the first goal. Weekly drills are conducted to ensure ERT responders are trained to perform these functions quickly and efficiently.
- **Stop the source:** this could mean rolling or up-righting a drum so that the hole is on top, patching a leaking hole, or locating and turning off

emergency valves. This step can occur at the same time as the spill is being contained.

- **Contain the spill:** the most common method is to place either absorbent or non-absorbent dikes around the perimeter of the spill.
- **File a spill report:** a copy of the Government of NWT Spill Report Form can be found in Appendix A.
- **Cleanup the spill:** after injured personnel are removed from the spill zone, the perimeter of the spill is clearly marked and the source of the spill is stopped, responders will begin to clean up the spill. They will work from the outside edge of the spill toward the centre to ensure the spill has been cleaned up. Various tools such as absorbent mats, socks and pillows are used to soak up small liquid spills, while vacuums and portable pumps can be utilized for larger spills. Heavy equipment can also be used for very large spills (e.g., bulldozers, gravel trucks, and forklifts). Neutralization of acidic spills using lime or soda ash is an option.
- **Contain or bag spent response materials:** to facilitate recycling or disposal.

The following decontamination steps may be taken during a spill response:

- **Set up decontamination facilities:** responders are trained to do this before entering a spill response area. This is especially important if there are victims, as these persons will need to be decontaminated prior to triage and treatment.
- **Decontaminate the area where the spill occurred:** may include cleaning tools, spill response equipment, PPE and the responders themselves.
- **Monitor the condition of responders:** on-site safety officers are trained to monitor the condition of personnel working on the decontamination lines, particularly if these people wear confined and bulky PPE (e.g., Level I suits). Decontaminating responders and tools can be labour intensive and workers can easily become fatigued from heat stress.

## 4.2 Spill Response Action Plans - General

For large volume hazardous materials on site, the Spill Response Action Plan and supplemental information on the chemical and physical properties is found in Appendix A.

### ***Respond Quickly***

- Identify spilled material.
- Protect yourself and others (e.g., be alert and take all necessary precautions).
- Assess the hazards in the immediate vicinity of the spill or leak.
- Shut off ignition sources in the vicinity of the spill for flammable liquids, – NO SMOKING.
- Call for assistance IMMEDIATELY, if anyone is injured.
- Attend to injured, if possible.
- Assess the severity of the spill. Assess if the spill, leak or system failure can be readily stopped or brought under control.
- Call for assistance; the Emergency Control Centre (ECC)
- Mobilize the ERT (the On-scene Coordinator does this).
- Keep people away from the spill site.
- Wear impervious clothing, goggles and gloves (appropriate for the material being dealt with).
- Approach spill from up-wind - ONLY IF IT IS SAFE TO DO SO.
- Stop product flow if possible.
- Contain and recover spill as soon as possible.

### ***Respond Safely***

- Do not contain gasoline/aviation fuel as vapours might ignite.
- Allow gasoline or aviation fuel spills to evaporate.
- Follow specific spill response actions (see Appendix A for Spill Response Actions and for Chemical and Physical Properties of Hazardous Materials).
- Report spill to the 24 hour spill report line **867-920-8130**.

Generic actions to be taken on land, water, snow and ice follow.

#### **4.2.1 Action Plan for Liquid Spills on Land**

Liquid spills on gravel, rock, soil and vegetation can be contained or cleaned up by:

- Placing soil berms in front of the leading edge of the spill, down slope of the spilled liquid. Plastic tarps can then be placed over the berm and at the foot of it to permit the liquid to pool on the plastic for easy recovery. Absorbents can also be used for this purpose. These pads can possibly be squeezed into empty drums and re-used. Larger pools can be pumped back into drums or empty storage tanks or a 'TIDY' tank, if readily available. It is very important to prevent the liquid from entering a body of water where it will likely have a greater environmental impact.
- Soaking up stained rock with absorbent materials or absorbent sheeting. Depending upon the volumes generated, the spent absorbent should be placed in drums for later disposal in dumpsters.
- Removing the contaminated soil and/or vegetation. This can be followed by contacting the government authority identified by the 24-Hour Spill Report Line 867-920-8130 to discuss the approach and to obtain approval to proceed with the approach.
- Storing the contaminated soil or gravel in drums at the Hazardous Waste Storage Facility until they are shipped off-site for disposal.

#### **4.2.2 Action Plan for Fuel Spills on Water**

The following steps can be taken for spills on water:

- Limit the area of the spill on water.
- Recover small spills on water with absorbent pads and similar materials.
- Deploy containment and/or absorbent boom(s) to contain the spill area. The effectiveness of this action can be limited by winds, waves and other factors. Absorbent booms can be drawn slowly in to encircle spilled fuel and absorb it. These materials are hydrophobic (absorb hydrocarbons and repel water). Sorbent booms are often relied on to recover hydrocarbons that escape containment booms.

- Placing a large wide board (e.g., plywood) vertically across the culvert inlet to control the water level while retaining the spilled fuel. The board can be secured by stakes and absorbent materials used to recover the fuel on the water surface.

#### **4.2.3 Action Plan for Fuel Spills on Snow**

Fuel spills on snow can be contained and recovered by:

- Using the snow as a natural absorbent to collect spilled fuel.
- Compacting the snow into snow-berms and then placing a liner of plastic sheeting.
- Scraping up and storing the snow-fuel mixture in a lined containment area or placing it in drums for later disposal or incineration.

#### **4.2.4 Action Plan for Fuel Spills on Ice**

Fuel spills on ice can be contained or cleaned up by:

- Compacting the snow around the edge of the spill to act as a berm. Time permitting; the berm can be lined with plastic sheeting. The underlying ice will prevent or reduce the rate of seepage of the fuel into the water below the ice.
- Scraping up contaminated snow/ice and placing it in covered drums or in a lined berm area on land.
- Deploying skimmers in open-water areas may be an option in the early fall or late spring. However, under normal ice-covered periods, this is unlikely in the Snap Lake region.
- Deploying skimmers in broken-ice conditions may be effective as spills tend to spread far less than in ice-free water.
- Pumping fuel spills through holes cut into the ice are extremely difficult under those conditions. Fuel that flows through breaks or cracks in the ice and gets trapped under the ice, is extremely difficult to recover.
- Burning on-ice offers the potential to remove the majority of a spill with minimal residue volumes left for manual recovery. Burning on-ice has always been considered as a primary arctic spill countermeasure. Permission may be given from the government to burn off pools of fuel (contact the NWT 24-Hour Spill Report Line).

## 5.0 SPILL RESPONSE EQUIPMENT AVAILABLE ON-SITE

### 5.1 General Equipment

The following general equipment is available on-site to assist in spill response:

- various types of heavy equipment such as Loaders, Excavators, Boom trucks, etc;
- various hand held tools including shovels; and
- sand bags, bentonite, and a variety of absorbent materials.

An Oil Spill Contingency Unit is located at the northeast end of the main camp. Spill response materials maintained within the unit, include:

Table 6 Oil Spill Kit Contents

Qty	Unit	Item
180	bags	Absorbent Peat Moss, <b>Oil</b> (only), 44 liters/bag
10	ea	Absorbent Rolls, <b>Oil</b> (only), 100' x 3'
100	pk	Absorbent Pads, <b>Oil</b> (only), 17" x 17" x 100/pk
40	boxes	Absorbent Socks, <b>Oil</b> (only), 8' x 3" x 6/box
40	bags	Absorbent Boom, <b>Oil</b> (only), 4" x 10' x 5/bag
12	boxes	Absorbent Pillows, <b>Oil</b> (only), 17" x 17" x 10/box
24	ea	Drip Defenders, 17" x 17"
12	ea	Mini Berm, 4' x 4' x 8"
6	ea	Absorbent Rolls, <b>Universal</b> , 100' x 3'
24	pk	Absorbent Pads, <b>Universal</b> , 17" x 17", 100/pk
48	pk	Absorbent Pads, <b>Chemical</b> , 17" x 17", 100/pk
6	boxes	Absorbent Socks, <b>Chemical</b> , 3" x 4' x 12/box
100	ea	Heavy Duty Poly Disposal Bags, Yellow, 36" x 48"

The following spill response equipment is located in an Oil Spill Response Unit near the fresh / fire water Pumphouse:

**Table 7 Pumphouse Spill Kit Contents**

<b>Qty</b>	<b>Unit</b>	<b>Item</b>
300	meters	Oil Containment Boom, 18" c/w associated hardware
1	ea	Oil Skimmer c/w power pack and transfer hosing
6	ea	Boats c/w outboard engines (seasonal)

## **5.2 Spill Kits by Location**

Spill kits come in a variety of sizes and are located throughout site being positioned adjacent all fuel / chemical storage and dispensing areas.

## **5.3 Small Spill Kits**

Numerous small spill kits with an absorption capacity of less than 95 Litres are located throughout the mine site. These small spill kits are used as a first line of defence when a spill is encountered. Table 8 identifies typical contents.

**Table 8 Small Spill Kit Contents (typical)**

<b>Qty</b>	<b>Unit</b>	<b>Item</b>
25	ea	Absorbent Pads, Oil (only), 17" x 17"
25	ea	Absorbent Pads, Universal, 17" x 17"
5	litres	Absorbent Granular and/or Peat
1	ea	Heavy Duty Poly Disposable Bag, Yellow, 36" x 48"
1	pr	Chemical Resistant Gloves
1	pr	Uvex Safety Goggles

#### 5.4 Large Spill Kits

Qty	Unit	Item
4	ea	Tyvek Splash Suits
2	ea	Large Tarps
5 -10	ea	Absorbent Socks, <b>Universal</b> , 4' x 3"
1 - 4	ea	Absorbent Boom, <b>Oil</b> (only), 10' x 5"
50 - 100	ea	Absorbent Pads, <b>Oil</b> (only), 17" x 17"
25 - 50	ea	Absorbent Pads, <b>Universal</b> , 17" x 17"
13 – 44	litres	Absorbent Granular and/or Peat
2 – 10	ea	Heavy Duty Poly Disposable Bags, Yellow, 36" x 48"
4	pr	Chemical Resistant Gloves
1	pr	Uvex Safety Goggles
1	ea	Roll Duct Tape
1	ea	Utility Knife
1	ea	Field notebook and pencil
1	ea	Rake
1	ea	Pick axe
3	ea	Aluminum scoop shovels
1	ea	Instruction binder
1	ea	Containment Drum

Large spill kits with an absorption capacity of less than 425 Litres are located throughout the mine site. These spill kits contains a variety of spill response equipment. This is summarized in Table 9.

**Table 9 Large Spill Kit Contents (typical)**

## 6.0 SUPPORTING DOCUMENTS

**AMEC E and C Services. 2001.** Snap Lake Advanced Exploration Program Sequencing Batch Reactor Waste Water Treatment Facility Process Description. March 2001.

**CANUTEC. 2004.** Emergency Response Guidebook: A Guidebook for First Responders during the Initial Phase of a Dangerous Goods/Hazardous Materials Incident.

**De Beers Canada Inc. (De Beers). 2005a** (update in progress). Snap Lake Mine: Emergency Response Plan. Submitted to the Mackenzie Valley Land and Water Board. September 2005.

**De Beers. 2010.** Snap Lake Mine: Hazardous Materials Management Plan. Submitted to the Mackenzie Valley Land and Water Board. June 2005.

**De Beers Canada Mining Inc. (De Beers). 2002.** Snap Lake Diamond Mine: Environmental Assessment Report. Submitted to the Mackenzie Valley Environmental Impact Review Board. February 2002.

**De Beers. 2004.** Annual Geotechnical Inspection of the PKC Area Dams. BGC Engineering. September 2004.

**Golder Associates. 1999.** Phase 1 Construction Specifications, Processed Kimberlite Containment Facility, Snap Lake Advanced Exploration Mine, NWT. Prepared for Winspear Diamonds Inc. November 1999.

**INAC. 2004.** Spill Reporting Protocol for Mining Operations in the Northwest Territories and Nunavut. August 2004.

**NWT Water Board. 1987.** Guidelines for Contingency Planning. January 1987.

**Tibbitt Contwoyto Winter Road Joint Venture** Spill Contingency Plan. January 2005.

**Winspear Diamonds Inc.** Dams 1 and 2 Construction As-Built Report. Snap Lake Diamond Mine. BGC Engineering. October 2000.

### Appendix A Spill Response Action Sheets

## 1 GASOLINE AND OTHER FUELS

### 1.1 SPILL RESPONSE ACTION

#### 1.1.1 Gasoline and Jet B Aviation Fuel

• **CONSIDER ACTION ONLY IF SAFETY PERMITS!**

- Gasoline and Jet B form vapours that can ignite and explode
- Do not smoke.
- Eliminate ignition sources.
- Stop source if safe to do so.

<p><b>On Land</b></p>	<p>Do not flush into ditches or drainage systems.</p> <p>Block entry into waterways and contain with earth or other barrier(s).</p> <p>Do not contain spill if there is any chance of igniting vapours.</p> <p>On shop floors and in work yards, apply particulate sorbents.</p> <p>On tundra use peat moss and leave in place to degrade, if possible.</p>
<p><b>On Snow and Ice</b></p>	<p>Block entry into waterways and contain with snow or other barrier.</p> <p>Do not contain spill if there is any chance of igniting vapours.</p> <p>In work yards, apply particulate sorbents.</p>
<p><b>On Muskeg</b></p>	<p>Do not deploy personnel and equipment on marsh or vegetation.</p> <p>Remove pooled gasoline or Jet B with pumps, if safe to do so.</p> <p>Flush with low pressure water to disperse small spills.</p> <p>Burn carefully only in localized areas, e.g., trenches, piles or</p>

	<p>windrows.</p> <p>Do not burn if root systems can be damaged (low water table).</p> <p>Minimize damage caused by equipment and excavation.</p>
<b>On Water</b>	<p>Do not attempt to contain or remove spills.</p> <p>Use spill containment boom to protect water intakes and sensitive areas.</p>
<b>Storage and Transfer</b>	<p>Store closed labeled containers outside and away from flammable items and incompatible materials.</p> <p>Electrically ground containers and vehicles during transfer to designated disposal or treatment area.</p>
<b>Disposal</b>	<p>Segregate waste types.</p> <p>Place contaminated materials into marked containers.</p> <p>Consult Environmental Coordinator on post spill requirements.</p>

## 1.2 GASOLINE

<b>Typical Physical and Chemical Properties</b>			
<b>Appearance</b>	colourless liquid (can be dyed)	<b>Flash Point</b>	-500°C

<b>Odour</b>	gasoline/Petroleum	<b>Pour Point</b>	-600°C
<b>Solubility</b>	insoluble	<b>Viscosity</b>	not viscous (<1cSt)
<b>Vapour Density</b>	will sink to ground levels	<b>Specific Gravity</b>	floats on water  (0.7 – 0.8)

### 1.2.1 Safety Measures

#### 1.2.1.1 Warnings

- Vapours form instantaneously, and are heavier than air.
- Empty containers can contain explosive vapours.
- Vapours can travel to distant sources of ignition and flash back.
- Eye contact causes irritation.
- Material can accumulate static charges.
- Inhalation of vapours can cause irritation of the respiratory tract, headache, vomiting, and unconsciousness.

#### 1.2.1.2 Personal Protection

- Always wear impervious, chemical-resistant clothing, gloves, footwear, and goggles (Nitrile, Viton and PVC are suitable materials).
- **DO NOT USE NATURAL RUBBER OR NEOPRENE.**
- Wear full-face organic vapour cartridge respirator where oxygen is adequate; otherwise, wear positive pressure SCBA, if circumstances warrant.

### 1.2.1.3 Precautions

- Monitor for explosive atmosphere.
- Avoid contact with strong oxidizers, such as nitric acid, sulphuric acid, chlorine, ozone, and peroxides.
- Eliminate ignition sources.
- Restrict access and work upwind of spill.

### 1.2.2 Response to Fires – Gasoline

CONSIDER ACTION ONLY IF SAFETY PERMITS!

- Wear SCBA in confined areas.
- Shut off fuel supply.
- Extinguish fire with CO<sub>2</sub>, dry chemical, alcohol foam or water fog.
- Use water to cool containers exposed to fire.

### 1.2.3 Response to Spills

CONSIDER ACTION ONLY IF SAFETY PERMITS!

#### 1.2.3.1 On Land

- Eliminate ignition sources.
- Do not flush into ditch/drainage systems.
- Block entry into waterways.
- Contain spill by diking with earth, snow or other barrier.
- Remove minor spills with peat moss and/or sorbent pads.

- Cover pools with foam to prevent vapour evolution if gasoline presents a fire hazard; otherwise allow vapours to dissipate.

#### 1.2.3.2 On Water

- Eliminate ignition sources.
- Do not attempt to contain or remove spills.
- Protection booms can be considered for water intakes.

#### 1.2.3.3 Storage & Transfer

- Store closed labeled containers in cool, ventilated areas away from incompatible materials.
- Electrically ground containers and vehicles during transfer.

#### 1.2.3.4 Disposal

- Place contaminated materials into marked containers.
- Consult with environmental authorities during final disposal.

### 1.2.4 First Aid – Gasoline

#### 1.2.4.1 Eyes

- Flush eyes immediately with fresh, warm water (NOT HOT WATER) for 20 minutes while holding the eyelids open.
- Remove contact lenses, if exposed to vapours or liquid.
- Get prompt medical attention.

#### 1.2.4.2 Skin

- Remove and launder contaminated clothing.

- Wash skin thoroughly with soap and water.
- Get medical attention.
- Discard saturated leather articles.

#### 1.2.4.3 Inhalation

- Move victim to fresh air.
- Perform CPR if victim is not breathing.
- Provide oxygen if victim is having difficulty breathing.
- Get prompt medical attention.

#### 1.2.4.4 Ingestion

- **DO NOT INDUCE VOMITING.** If victim is conscious, give milk or water to drink. If vomiting begins, keep victim's head below hips to prevent aspiration.
- Get prompt medical attention.

### 1.3 JET-B (JP-4)

Typical Physical and Chemical Properties			
<b>Appearance</b>	White or pale yellow liquid	<b>Flash Point</b>	-38°C
<b>Odour</b>	Petroleum	<b>Freezing Point</b>	-47°C
<b>Solubility</b>	Negligible	<b>Viscosity</b>	8.00 cSt at -20°C
<b>Vapour Density</b>	4	<b>Specific Gravity</b>	Not available

### 1.3.1 Safety Measures

#### 1.3.1.1 Warnings

- Vapours instantaneously form, and are heavier than air.
- Low-lying areas can trap explosive vapours.
- Vapours can travel to distant sources of ignition and flash back.
- Eye contact causes irritation.
- Material can accumulate static charges.
- Inhalation of vapours can cause irritation of the respiratory tract, headache, vomiting, and unconsciousness.

#### 1.3.1.2 Personal Protection

- Always wear impervious, chemical-resistant clothing, gloves, footwear, and goggles (Nitrile and Viton are suitable materials).
- **DO NOT USE NATURAL RUBBER, NEOPRENE OR PVC.**
- Wear full-face organic vapour cartridge respirator where oxygen is adequate, otherwise wear SCBA, if circumstances warrant.

#### 1.3.1.3 Precautions

- Monitor for explosive atmosphere.
- Avoid contact with strong oxidizers, such as nitric acid, sulphuric acid, chlorine, ozone, and peroxides.
- Eliminate ignition sources.
- Restrict access and work upwind of spill.

### 1.3.2 Response to Fires – Jet B (JP-4)

#### 1.3.3 Consider Action Only If Safety Permits!

- Wear SCBA in confined areas.
- Shut off fuel supply.
- Extinguish fire with CO<sub>2</sub>, dry chemical, alcohol foam or water fog.
- Use water to cool containers exposed to fire.

#### 1.3.4 Response to Spills

#### 1.3.5 Consider Action Only if Safety Permits!

##### 1.3.5.1 On Land

- ELIMINATE IGNITION SOURCES.
- Block entry into waterways. Do not flush into ditch/drain systems.
- Contain spill by diking with earth, snow or other barrier.
- Remove minor spills with sorbent or explosion-proof pump.
- Cover pools with foam to prevent vapour evolution if avgas presents a fire hazard otherwise allow vapours to dissipate.

##### 1.3.5.2 On Water

- ELIMINATE IGNITION SOURCES.
- Contain or remove spills ONLY AFTER VAPOURS DISSIPATE.
- Protection booming can be considered for water intakes.
- Recover slicks using skimmer and sorbent, if volumes warrant.

##### 1.3.5.3 Storage & Transfer

- Store closed labeled containers in cool, ventilated areas away from incompatible materials.
- Electrically ground containers and vehicles during transfer.

#### 1.3.5.4 Disposal

- Segregate waste types.
- Place contaminated materials into segregated, marked containers.
- Consult with environmental authorities during final disposal.

#### 1.3.6 FIRST AID – JET B (JP-4)

##### 1.3.6.1 Eyes

- Flush eyes immediately with fresh, warm water (NOT HOT WATER) for 20 minutes while holding the eyelids open.
- Remove contact lenses, if exposed to vapours or liquid.
- Get prompt medical attention.

##### 1.3.6.2 Skin

- Remove and launder contaminated clothing.
- Wash skin thoroughly with soap and water.
- Get medical attention.
- Discard saturated leather articles.

##### 1.3.6.3 Inhalation

- Move victim to fresh air.
- Perform CPR if victim is not breathing.
- Provide oxygen if victim is having difficulty breathing.

- Get prompt medical attention.

#### 1.3.6.4 Ingestion

- **DO NOT INDUCE VOMITING.** If victim is conscious, give milk or water to drink. If vomiting begins, keep victim's head below hips to prevent aspiration.
- Get prompt medical attention.

### 1.4 DIESEL

Typical Physical and Chemical Properties			
<b>Appearance</b>	Clear, yellow or red	<b>Flash Point</b>	400°C (minimum)
<b>Odour</b>	Petroleum	<b>Pour Point</b>	-50 to -60°C
<b>Solubility</b>	Insoluble	<b>Viscosity</b>	Not viscous
<b>Vapour Density</b>	Will sink to ground levels	<b>Specific Gravity</b>	Floats on water  (0.8 – 0.9)

#### 1.4.1 Safety Measures

##### 1.4.1.1 Warnings

- Vapours are heavier than air and form easily at high temperatures.
- Empty containers can contain explosive vapours.
- Toxic gases form upon combustion.

- Eye contact causes irritation.
- Material can accumulate static charges.
- Inhalation of vapours can cause irritation of the respiratory tract, headache, vomiting, and unconsciousness.

#### 1.4.2 Personal Protection

- Always wear impervious, chemical-resistant clothing, gloves, footwear, and goggles (Nitrile, Viton and PVC are suitable materials).
- DO NOT USE NATURAL RUBBER OR NEOPRENE.
- Wear full-face organic vapour cartridge respirator where oxygen is adequate, otherwise wear positive pressure SCBA.

#### 1.4.3 Precautions

- Monitor for explosive atmosphere.
- Avoid contact with strong oxidizers, such as nitric acid, sulphuric acid, chlorine, ozone, and peroxides.
- Eliminate ignition sources.
- Restrict access and work upwind of spill.

#### 1.4.4 Response to Fires – Diesel

#### 1.4.5 Consider Action Only if Safety Permits!

- Wear SCBA in confined areas.
- Shut off fuel supply.
- Extinguish fire with CO<sub>2</sub>, dry chemical, alcohol foam or water fog.
- Use water to cool containers exposed to fire.

#### 1.4.6 Response to Spills

#### 1.4.7 Consider Action Only if Safety Permits!

##### 1.4.7.1 On Land

###### • **ELIMINATE IGNITION SOURCES.**

- Do not flush into ditch/drainage systems.
- Block entry into waterways.
- Contain spill by diking with earth, snow or other barrier.
- Remove minor spills with peat moss and/or sorbent pads.
- Remove large spills with pumps or vacuum equipment.

##### 1.4.7.2 On Water

- Use booms to contain and concentrate spill.
- Remove spill using sorbent, skimmer or vacuum truck.
- Protection booming can be considered for water intakes.

##### 1.4.7.3 Storage & Transfer

- Store closed labeled containers in cool, ventilated areas away from incompatible materials.
- Electrically ground containers and vehicles during transfer.

##### 1.4.7.4 Disposal

- Segregate waste types.
- Place contaminated materials into marked containers.
- Consult with environmental authorities during final disposal.

##### 1.4.8 First Aid – Diesel

#### 1.4.8.1 Eyes

- Flush eyes immediately with fresh, warm water (NOT HOT WATER) for 20 minutes while holding the eyelids open.
- Remove contact lenses, if exposed to vapours or liquid.
- Get prompt medical attention.

#### 1.4.8.2 Skin

- Remove and launder contaminated clothing.
- Wash skin thoroughly with soap and water.
- Get medical attention.
- Discard saturated leather articles.

#### 1.4.8.3 Inhalation

- Move victim to fresh air.
- Perform CPR if victim is not breathing.
- Provide oxygen if victim is having difficulty breathing.
- Get prompt medical attention.

#### 1.4.8.4 Ingestion

- **DO NOT INDUCE VOMITING.** If victim is conscious, give milk or water to drink. If vomiting begins, keep victim's head below hips to prevent aspiration.
- Get prompt medical attention.

## 2 OILS AND OTHER LUBRICANTS

### 2.1 SPILL RESPONSE ACTION

#### 2.1.1 Hydraulic, Lube and Waste Oils

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- **CONSIDER ACTION ONLY IF SAFETY PERMITS!**

- Eliminate ignition sources.
- Stop source if safe to do so.

On Land	<p>Do not flush into ditches or drainage systems</p> <p>Block entry into waterways and contain with earth or other barrier(s).</p> <p>Remove small spills with absorbent pads.</p> <p>Remove contaminated soils to salvage drums for disposal offsite, residual volumes (films) on large boulders may require remediation in-situ through aeration and biodegradation.</p>
On Snow and Ice	<p>Block entry into waterways and contain with snow or other barrier.</p> <p>Remove minor spills with absorbent pads and/or snow.</p> <p>Use ice augers and pump when feasible to recover diesel under ice.</p> <p>Slots in ice can be cut over slow moving water to contain oil.</p> <p>Burn using Tiger Torches if unrecoverable by other methods, feasible and safe to do so.</p>
On Muskeg	<p>Do not deploy personnel and equipment on marsh or vegetation.</p> <p>Remove pooled oil with absorbent pads and/or skimmer.</p> <p>Flush with low-pressure water to herd oil to collection point.</p> <p>Burn only in localized areas, e.g., trenches, piles or windrows.</p> <p>Do not burn if root systems can be damaged (low water table).</p> <p>Minimize damage caused by equipment and excavation.</p>

On Water	<p>Contain spill as close to the release point as possible.</p> <p>Use spill containment boom to concentrate slicks for recovery.</p> <p>On small spills, use absorbent pads to pick up oil.</p> <p>On larger spills, obtain and use skimmer on boomed slicks.</p>
Streams	<p>Prevent entry into water by building a berm or trench.</p> <p>Intercept moving slicks using booms.</p> <p>Do not use booms/pads in fast currents and turbulent water.</p>
Storage and Transfer	<p>Store closed labeled containers outside and away from flammable items.</p> <p>Electricity ground containers and vehicles during transfer to designated disposal or treatment area.</p>
Disposal	<p>Segregate waste types.</p> <p>Place contaminated materials into marked containers.</p> <p>Consult Environmental Coordinator on post spill requirements.</p>

## 2.2 HYRAULIC OIL

<b>Typical Physical and Chemical Properties</b>			
Appearance	Straw-yellow liquid	Flash Point	2150°C
Odour	Petroleum	Pour Point	-25°C
Solubility	Generally insoluble	Viscosity	Medium (265 cSt, 15°C)

Vapour Density	Few vapours emitted	Specific Gravity	Floats on water (0.9)
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## 2.2.1 Safety Measures

### 2.2.1.1 Warnings

- Vapours are heavier than air but are unlikely to form.
- Toxic gas can form in fire and at high temperatures.
- CO, CO<sub>2</sub>, and dense smoke are produced upon combustion.
- Oil mist or vapour from hot oil can cause irritation of the eyes, nose, throat and lungs.

### 2.2.1.2 Personal Protection

- Always wear impervious, chemical-resistant clothing, gloves, footwear, and goggles (PVC, Nitrile, and Viton are suitable materials).
- DO NOT USE NATURAL RUBBER.
- Use of organic vapour cartridge respirator is highly unlikely.

### 2.2.1.3 Precautions

- Avoid excessive heat, which can cause formation of vapours.
- Avoid contact with strong oxidizers, such as nitric acid, sulphuric acid, chlorine, ozone, and peroxides.
- Eliminate ignition sources.
- Restrict access and work upwind of spill.

## 2.2.2 Response to Fires – Hydraulic Oil

### 2.2.3 Consider Action Only if Safety Permits!

- Wear SCBA and eye protection when responding to fires.
- Shut off fuel supply.
- Extinguish fire with CO<sub>2</sub>, dry chemical, alcohol foam or water fog.
- NOTE: Water or foam may cause frothing.
- Use water to cool containers exposed to fire.

### 2.2.4 Response to Spills

#### 2.2.5 Consider Action Only If Safety Permits!

##### 2.2.5.1 On Land

- Prevent additional discharge of oil.
- Do not flush into ditch/drainage systems.
- Block entry into waterways.
- Contain spill by diking with earth, snow or other barrier.
- Remove minor spills with peat moss and/or sorbent pads.
- Remove large spills with pumps or vacuum equipment. Spill can also be mechanically removed if oil is too viscous to be pumped.

##### 2.2.5.2 On Water

- Use booms to contain and concentrate spill.
- Remove spill using sorbent, skimmer or vacuum truck.
- Protection booming can be considered for water intakes.

##### 2.2.5.3 Storage & Transfer

- Store closed labeled containers in cool, ventilated areas away from incompatible materials.

#### 2.2.5.4 Disposal

- Segregate waste types.
- Place contaminated materials into marked containers.
- Consult with environmental authorities during final disposal.

#### 2.2.6 First Aid – Hydraulic Oil

##### 2.2.6.1 Eyes

- Flush eyes immediately with fresh, warm water (NOT HOT WATER) for 20 minutes while holding the eyelids open.
- Remove contact lenses, if exposed to vapours or liquid.
- Get prompt medical attention.

##### 2.2.6.2 Skin

- Remove and launder contaminated clothing.
- Wash skin thoroughly with soap and water.
- Get medical attention.
- Discard saturated leather articles.

##### 2.2.6.3 Inhalation

- Move victim to fresh air.
- Perform CPR if victim is not breathing.
- Provide oxygen if victim is having difficulty breathing.
- Get prompt medical attention.

### 2.2.6.4 Ingestion

- **DO NOT INDUCE VOMITING.** If victim is conscious, give milk or water to drink. If vomiting begins, keep victim's head below hips to prevent aspiration.
- Get prompt medical attention.

## 2.3 LUBE OIL

Typical Physical and Chemical Properties			
<b>Appearance</b>	Amber liquid	<b>Flash Point</b>	190 to 2200°C
<b>Odour</b>	Petroleum	<b>Pour Point</b>	-35 to -400°C
<b>Solubility</b>	Generally insoluble	<b>Viscosity</b>	Medium (255 cSt, 150°C)
<b>Vapour</b>	Few vapours emitted	<b>Specific Gravity</b>	Floats on water (0.9)

### 2.3.1 Safety Measures

#### 2.3.1.1 Warnings

- Vapours are heavier than air but are unlikely to form.
- Toxic gas can form in fire and at high temperatures.
- CO, CO<sub>2</sub>, and dense smoke are produced upon combustion.
- Oil mist or vapour from hot oil can cause irritation of the eyes, nose, throat and lungs.

### 2.3.1.2 Personal Protection

- Always wear impervious, chemical-resistant clothing, gloves, footwear, and goggles (Nitrile, Viton and PVC are suitable materials).
- DO NOT USE NATURAL RUBBER.
- Use of organic vapour cartridge respirator is highly unlikely.

### 2.3.1.3 Precautions

- Avoid excessive heat, which can cause formation of vapours.
- Avoid contact with strong oxidizers, such as nitric acid, sulphuric acid, chlorine, ozone, and peroxides.
- Eliminate ignition sources.
- Restrict access and work upwind of spill.

## 2.3.2 RESPONSE TO FIRES – LUBE OIL

### 2.3.2.1 Consider Action Only If Safety Permits!

- Wear SCBA and eye protection when responding to lube oil fires.
- Shut off fuel supply.
- Extinguish fire with CO<sub>2</sub>, dry chemical, alcohol foam or water fog. NOTE: water or foam may cause frothing.
- Use water to cool containers exposed to fire.

## 2.3.3 RESPONSE TO SPILLS

### 2.3.4 Consider Action Only If Safety Permits!

#### 2.3.4.1 On Land

- Prevent additional discharge of oil.

- Do not flush into ditch/drainage systems.
- Block entry into waterways.
- Contain spill by diking with earth, snow or other barrier.
- Remove minor spills with peat moss and/or sorbent pads.
- Remove large spills with pumps or vacuum equipment. Spill can also be mechanically removed if oil is too viscous to be pumped.

#### 2.3.4.2 On Water

- Use booms to contain and concentrate spill.
- Remove spill using sorbent, skimmer or vacuum truck.
- Protection booming can be considered for water intakes.

#### 2.3.4.3 Storage & Transfer

- Store closed labeled containers in cool, ventilated areas away from incompatible materials.

#### 2.3.4.4 Disposal

- Segregate waste types.
- Place contaminated materials into marked containers.
- Consult with environmental authorities during final disposal.

#### 2.3.5 First Aid – Lube Oil

##### 2.3.5.1 Eyes

- Flush eyes immediately with fresh, warm water (NOT HOT WATER) for 20 minutes while holding the eyelids open.
- Remove contact lenses, if exposed to vapours or liquid.

- Get prompt medical attention.

#### 2.3.5.2 Skin

- Remove and launder contaminated clothing.
- Wash skin thoroughly with soap and water.
- Get medical attention.
- Discard saturated leather articles.

#### 2.3.5.3 Inhalation

- Move victim to fresh air.
- Perform CPR if victim is not breathing.
- Provide oxygen if victim is having difficulty breathing.
- Get prompt medical attention.

#### 2.3.5.4 Ingestion

- **DO NOT INDUCE VOMITING.** If victim is conscious, give milk or water to drink. If vomiting begins, keep victim's head below hips to prevent aspiration.
- Get prompt medical attention.

### 2.4 WASTE OIL

Typical Physical and Chemical Properties			
<b>Appearance</b>	Black to brown liquid	<b>Flash Point</b>	100 to 2000°C
<b>Odour</b>	Petroleum	<b>Pour Point</b>	-30 to -400°C

<b>Solubility</b>	Generally insoluble	<b>Viscosity</b>	Medium  (200 – 300 cSt)
<b>Vapour</b>	Few vapours emitted	<b>Specific Gravity</b>	Floats on water (0.9)

## 2.4.1 Safety Measures

### 2.4.1.1 Warnings

- Vapours are heavier than air and are unlikely to form.
- Toxic gas can form in fire and at high temperatures.
- CO, CO<sub>2</sub>, and dense smoke are produced upon combustion.

### 2.4.1.2 Personal Protection

- Always wear impervious, chemical-resistant clothing, gloves, footwear, and goggles (Nitrile, Viton and PVC are suitable materials). **DO NOT USE NATURAL RUBBER OR NEOPRENE.**
- Use of organic vapour cartridge respirator is highly unlikely.

### 2.4.1.3 Precautions

- Avoid excessive heat, which can cause formation of vapours.
- Avoid contact with strong oxidizers, such as nitric acid, sulphuric acid, chlorine, ozone, and peroxides.
- Eliminate ignition sources.
- Restrict access and work upwind of spill.

## 2.4.2 RESPONSE TO FIRES – WASTE OIL

### 2.4.3 Consider Action Only If Safety Permits!

- Wear SCBA and eye protection when responding to lube oil fires.
- Shut off fuel supply.
- Extinguish fire with CO<sub>2</sub>, dry chemical, alcohol foam or water fog. NOTE: Water or foam may cause frothing.
- Use water to cool containers exposed to fire.

## 2.4.4 RESPONSE TO SPILLS

### 2.4.5 Consider Action Only If Safety Permits!

#### 2.4.5.1 On Land

- Prevent additional discharge of oil.
- Do not flush into ditch/drainage systems.
- Block entry into waterways.
- Contain spill by diking with earth, snow or other barrier.
- Remove minor spills with peat moss and/or sorbent pads.
- Remove large spills with pumps or vacuum equipment. Spill can also be mechanically removed if oil is too viscous to be pumped.

#### 2.4.5.2 On Water

- Use booms to contain and concentrate spill.
- Remove spill using absorbent, skimmer or vacuum truck.
- Protection booming can be considered for water intakes.

#### 2.4.5.3 Storage & Transfer

- Store closed labeled containers in cool, ventilated areas away from incompatible materials.
- Electrically ground containers and vehicles during transfer.

#### 2.4.5.4 Disposal

- Segregate waste types.
- Place contaminated materials into marked containers.
- Consult with environmental authorities during final disposal

#### 2.4.6 First Aid – Waste Oil

##### 2.4.6.1 Eyes

- Flush eyes immediately with fresh, warm water (NOT HOT WATER) for 20 minutes while holding the eyelids open.
- Remove contact lenses, if exposed to vapours or liquid.
- Get prompt medical attention.

##### 2.4.6.2 Skin

- Remove and launder contaminated clothing.
- Wash skin thoroughly with soap and water.
- Get medical attention.
- Discard saturated leather articles.

##### 2.4.6.3 Inhalation

- Move victim to fresh air.
- Perform CPR if victim is not breathing.
- Provide oxygen if victim is having difficulty breathing.

- Get prompt medical attention.

#### 2.4.6.4 Ingestion

- **DO NOT INDUCE VOMITING.** If victim is conscious, give milk or water to drink. If vomiting begins, keep victim's head below hips to prevent aspiration.
- Get prompt medical attention.

### 3 ETHYLENE GLYCOL

#### 3.1 SPILL RESPONSE ACTION

##### 3.1.1 Ethylene Glycol (Antifreeze)

- Consider Action Only If Safety Permits!

<p><b>On Land</b></p>	<p>Do not flush into ditches or drainage systems</p> <p>Block entry into waterways.</p> <p>Contain spill by diking with earth or other barrier.</p> <p>Remove minor spills with sorbent.</p> <p>Remove large spills with pumps or vacuum equipment.</p>
<p><b>On Snow and Ice</b></p>	<p>Block entry into waterways and contain with snow or other barrier.</p> <p>Do not flush into ditches or drainage systems.</p> <p>Remove minor spills with sorbent.</p> <p>Remove contaminated snow with shovels or mechanical equipment.</p>
<p><b>On Muskeg</b></p>	<p>Do not deploy personnel and equipment on marsh or vegetation.</p> <p>Remove pooled antifreeze with pumps.</p>

	<p>Burning is not feasible.</p> <p>Minimize damage caused by equipment and excavation.</p>
<b>On Water</b>	<p>Ethylene glycol sinks and mixes with water.</p> <p>Isolate/confine spill by damming or diversion.</p> <p>Use spill containment boom to protect water intakes and sensitive areas.</p>
<b>Storage and Transfer</b>	<p>Store closed labeled in cool, ventilated areas away from incompatible materials, e.g., organics, finely divided metals and oxidizable materials.</p>
<b>Disposal</b>	<p>Segregate waste types.</p> <p>Place contaminated materials into marked containers.</p> <p>Consult Environmental Coordinator on post spill requirements.</p>

### 3.2 ANTIFREEZE (ETHYLENE GLYCOL)

<b>Typical Physical and Chemical Properties</b>			
<b>Appearance</b>	Colourless liquid	<b>Flash Point</b>	1110°C
<b>Odour</b>	Slight, undetectable < 25 ppm	<b>Pour Point</b>	-130°C
<b>Solubility</b>	Soluble in all proportions	<b>Viscosity</b>	Not viscous (22 cSt)
<b>Vapour Density</b>	Will sink to ground levels	<b>Specific Gravity</b>	Same as water (1.0)

### 3.2.1 Safety Measures

#### 3.2.1.1 Warnings

- Vapours are heavier than air.
- Ingestion of significant quantities can be lethal.
- Eye contact causes irritation.
- Skin contact can cause intoxication due to absorption.
- Inhalation of vapours can cause intoxication, headache, vomiting, unconsciousness with convulsions, and even death. Avoid inhaling vapours, particularly in enclosed places.

#### 3.2.1.2 Personal Protection

- Always wear impervious, chemical-resistant clothing, gloves, footwear, and goggles (Nitrile, Neoprene and PVC are suitable protective materials).

#### 3.2.1.3 Precautions

- Monitor empty containers for explosive atmosphere.
- Avoid contact with strong oxidizers, such as nitric acid, sulphuric acid, chlorine, ozone, and peroxides.
- Eliminate ignition sources.
- Restrict access and work upwind of spill.

### 3.2.2 RESPONSE TO FIRES – ETHYLENE GLYCOL

#### 3.2.3 Consider Action Only If Safety Permits!

- Wear SCBA in confined areas.

- Shut off fuel supply.
- Extinguish fire with CO<sub>2</sub>, dry chemical, alcohol foam or water fog. NOTE: Water or foam may cause frothing).
- Use water to cool containers exposed to fire.

### 3.2.4 RESPONSE TO SPILLS

#### 3.2.5 Consider Action Only If Safety Permits

##### 3.2.5.1 On Land

- Block entry into waterways.
- Do not flush into ditch/drainage systems.
- Contain spill by diking with earth, snow or other barrier.
- Remove minor spills with peat moss and/or sorbent pads.
- Remove large spills with pumps or vacuum equipment.

##### 3.2.5.2 On Water

- Ethylene glycol sinks and mixes with water. Contain spill by isolating contaminated water through damming or diversion.

##### 3.2.5.3 Storage & Transfer

- Store closed labeled containers in cool, ventilated areas away from incompatible materials.

##### 3.2.5.4 Disposal

- Segregate waste types.
- Place contaminated materials into marked containers.
- Consult with environmental authorities during final disposal.

### 3.2.6 First Aid – Ethylene Glycol

#### 3.2.6.1 Eyes

- Flush eyes immediately with fresh, warm water (NOT HOT WATER) for 20 minutes while holding the eyelids open.
- Remove contact lenses, if exposed to vapours or liquid.
- Get prompt medical attention.

#### 3.2.6.2 Skin

- Remove contaminated clothing.
- Wash skin thoroughly with soap and water.
- Get medical attention.

#### 3.2.6.3 Inhalation

- Move victim to fresh air.
- Perform CPR if victim is not breathing (**USE HOLGER-NIELSON METHOD AND NOT MOUTH-TO-MOUTH METHOD IF VICTIM INHALED OR INGESTED THE SUBSTANCE**).
- Provide oxygen if victim is having difficulty breathing.
- Get prompt medical attention.

#### 3.2.6.4 Ingestion

- **DO NOT INDUCE VOMITING.** If victim is conscious, give milk or water to drink. If vomiting begins, keep victim's head below hips to prevent aspiration.
- Get prompt medical attention.

## 4 COMPRESSED GASES

### 4.1 ACETYLENE PROPANE

#### 4.1.1 Spill Response Action

- Acetylene and Propane
- Consider Action Only If Safety Permits!

***Gases stored in cylinders can explode when ignited.***

**Keep vehicles away from accident area.**

- Vapours cannot be contained when released.
- Water spray can be used to knock down vapours if there is NO chance of ignition.
- Small fires can be extinguished with dry chemical or carbon dioxide (CO<sub>2</sub>).
- Personnel should withdraw immediately from area unless it is a small leak that has been stopped IMMEDIATELY after detection.
- If tanks are damaged, gas should be allowed to disperse and no attempted recovery made.
- Personnel should avoid touching release point on containers since frost quickly forms.
- Keep away from tank ends.

#### 4.2 ACETYLENE

Typical Physical and Chemical Properties			
<b>Appearance</b>	Colourless gas	<b>Flash Point</b>	-180°C

<b>Odour</b>	Garlic like	<b>Freezing Pt.</b>	-820°C
<b>Solubility</b>	Slightly soluble	<b>Viscosity</b>	N/A
<b>Vapour Density</b>	Will sink to ground levels	<b>Specific Gravity</b>	Liquid floats on water (0.6)

#### 4.2.1 Safety Measures

##### 4.2.1.1 Warnings

- Vapours from instantaneously, and are heavier than air.
- Empty containers can contain explosive vapours.
- Vapours can travel to distant sources of ignition and flash back.
- Eye contact causes irritation.
- Material can accumulate static charges.
- Inhalation of vapours can cause irritation of the respiratory tract, headache, vomiting, and unconsciousness.

##### 4.2.1.2 Personal Protection

- Always wear impervious, chemical-resistant clothing, gloves, footwear, and goggles (Nitrile and Viton are suitable materials).
- **DO NOT USE NATURAL RUBBER OR NEOPRENE OR PVC.**
- Wear full-face organic vapour cartridge respirator where oxygen is adequate, otherwise wear positive pressure SCBA.

##### 4.2.1.3 Precautions

- Monitor for explosive atmosphere.

- Avoid contact with strong oxidizers, such as nitric acid, sulphuric acid, chlorine, ozone, and peroxides.
- Eliminate ignition sources.
- Restrict access and work upwind of spill.

#### 4.2.2 Response to Fires – Acetylene

#### 4.2.3 Consider Action Only If Safety Permits!

- Wear SCBA in confined areas.
- Shut off fuel supply.
- Extinguish fire with CO<sub>2</sub>, dry chemical, alcohol foam or water fog.
- Use water to cool containers exposed to fire.

#### 4.2.4 RESPONSE TO GAS RELEASES

#### 4.2.5 Consider Action Only If Safety Permits!

##### 4.2.5.1 On Land

- **ELIMINATE IGNITION SOURCES.**
- **DO NOT ATTEMPT TO CONTAIN OR REMOVE RELEASES.**

##### 4.2.5.2 On Water

- **ELIMINATE IGNITION SOURCES.**
- **DO NOT ATTEMPT TO CONTAIN OR REMOVE RELEASES.**

##### 4.2.5.3 Storage & Transfer

- Store closed labeled containers in cool, ventilated areas away from incompatible materials.
- Electrically ground containers and vehicles during transfer.

#### 4.2.5.4 Disposal

- Consult with environmental authorities if the disposal of any contaminated materials is required.

#### 4.2.6 First Aid – Acetylene

##### 4.2.6.1 Eyes

- Flush eyes immediately with fresh, warm water (NOT HOT WATER) for 20 minutes while holding the eyelids open.
- Remove contact lenses, if exposed to vapours or liquid.
- Get prompt medical attention.

##### 4.2.6.2 Skin

- Remove and launder contaminated clothing.
- Wash skin thoroughly with soap and water.
- Get medical attention.
- Discard saturated leather articles.

##### 4.2.6.3 Inhalation

- Move victim to fresh air.
- Perform CPR if victim is not breathing.
- Provide oxygen if victim is having difficulty breathing.
- Get prompt medical attention.

##### 4.2.6.4 Ingestion

- **DO NOT INDUCE VOMITING.** If victim is conscious, give milk or water to drink. If vomiting begins, keep victim's head below hips to prevent aspiration.

- Get prompt medical attention.

### 4.3 PROPANE

Typical Physical and Chemical Properties			
Appearance	Colourless gas	Flash Point	-104°C
Odour	Natural gas odour	Freezing Point	-190°C
Solubility	Insoluble	Viscosity	N/A
Vapour Density	Will sink to ground levels	Specific Gravity	Liquid floats on water

#### 4.3.1 Safety Measures

##### 4.3.1.1 Warnings

- Vapours form instantaneously, and are heavier than air.
- **AVOID GOING INTO LOW LYING AREAS.**
- **WEAR SCBA AND PERSONAL GAS & OXYGEN**
- **MONITORS**
- Vapours can travel to distant sources of ignition and flash back.
- Toxic gases form upon combustion.
- Eye contact causes irritation.
- Material can accumulate static charges.

- Inhalation of vapours can cause irritation of the respiratory tract, headache, vomiting, and unconsciousness.

#### 4.3.1.2 Personal Protection

- Always wear impervious, chemical-resistant clothing, gloves, footwear, and goggles (Nitrile and Viton are suitable materials).

- **DO NOT USE NATURAL RUBBER, NEOPRENE OR PVC.**

- Avoid frostbite burn to skin and eyes from contact with propane.
- Wear full-face organic vapour cartridge respirator where oxygen is adequate, otherwise wear positive pressure SCBA.

#### 4.3.1.3 Precautions

- Monitor for explosive atmosphere.
- Avoid contact with strong oxidizers, such as nitric acid, sulphuric acid, chlorine, ozone, and peroxides.
- Eliminate ignition sources.
- Restrict access and work upwind of spill.

#### 4.3.2 Response to Fires – Propane

#### 4.3.3 Consider Action Only If Safety Permits!

- Wear SCBA in confined areas.
- Shut off fuel supply.
- Extinguish fire with CO<sub>2</sub>, dry chemical, alcohol foam or water fog.
- Use water to cool containers exposed to fire.

#### 4.3.4 RESPONSE TO GAS RELEASES

#### 4.3.5 Consider Action Only If Safety Permits!

#### 4.3.5.1 On Land

- **ELIMINATE IGNITION SOURCES.**
- **DO NOT ATTEMPT TO CONTAIN OR REMOVE SPILLS.**

#### 4.3.5.2 On Water

- **ELIMINATE IGNITION SOURCES**
- **DO NOT ATTEMPT TO CONTAIN OR REMOVE SPILLS**

#### 4.3.5.3 Storage & Transfer

- It is not possible to collect released material.

#### 4.3.5.4 Disposal

- Consult with environmental authorities if the disposal of any contaminated materials is required.

#### 4.3.6 First Aid – Propane

##### 4.3.6.1 Eyes

- Flush eyes immediately with fresh, warm water (NOT HOT WATER) for 20 minutes while holding the eyelids open.
- Remove contact lenses, if exposed to vapours or liquid.
- Get prompt medical attention.

##### 4.3.6.2 Skin

- Remove and launder contaminated clothing.
- Wash skin thoroughly with soap and water.
- Get medical attention.
- Discard saturated leather articles.

#### 4.3.6.3 Inhalation

- Move victim to fresh air.
- Perform CPR if victim is not breathing.
- Provide oxygen if victim is having difficulty breathing.
- Get prompt medical attention.

#### 4.3.6.4 Ingestion

- **DO NOT INDUCE VOMITING.** If victim is conscious, give milk or water to drink. If vomiting begins, keep victim's head below hips to prevent aspiration.
- Get prompt medical attention.

### 5 EXPLOSIVES

#### 5.1 SPILL RESPONSE ACTION

##### 5.1.1 Ammonium Nitrate

- Consider Action Only If Safety Permits!
- Prolonged contact and repeated skin contact can cause irritation.
- Eliminate ignition sources.
- Stop source if safe to do so.

<p><b>On Land</b></p>	<p>Do not flush into ditches or drainage systems.</p> <p>Block entry into waterways and contain with earth or other barrier(s).</p> <p>Do not contain spill if there is any chance of igniting vapours.</p> <p>If liquid, remove minor spills with sorbent and large spills with pumps</p>
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	<p>or vacuum equipment.</p> <p>If prill / granules, can be shoveled or removed mechanically.</p> <p>On tundra, spread and leave as fertilizer if feasible.</p>
<b>On Snow and Ice</b>	<p>Block entry into waterways and contain with snow or other barrier.</p> <p>Remove ammonium nitrate and contaminated snow with shovels or other mechanical means.</p>
<b>On Muskeg</b>	<p>Do not deploy personnel and equipment on marsh or vegetation.</p> <p>Remove ammonium nitrate and contaminated snow with shovels or other mechanical means if feasible.</p> <p>Burning is not feasible.</p> <p>Flushing with low pressure water can be tried if feasible.</p> <p>Minor spill amounts can be left in place to serve as fertilizer.</p> <p>Minimize damage caused by equipment and excavation.</p>
<b>On Water</b>	<p>Ammonium nitrate is completely soluble in water and is difficult to recover.</p> <p>Water flushing can be tried to disperse spill.</p>
<b>Storage and Transfer</b>	<p>Store closed labeled containers in cool, ventilated areas away from incompatible materials, e.g., oxidizable materials.</p>
<b>Disposal</b>	<p>Segregate waste types.</p> <p>Place contaminated materials into marked containers.</p> <p>Consult Environmental Coordinator on post spill requirements.</p>

## 5.2 AMMONIUM NITRATE and SODIUM NITRATE

<b>Typical Physical And Chemical Properties</b>			
<b>Appearance</b>	White pellets or granules. Also colourless liquid.	<b>Flash Point</b>	N/A
<b>Odour</b>	Slight	<b>Pour Point</b>	N/A
<b>Solubility</b>	Completely soluble	<b>Viscosity</b>	N/A
<b>Vapour Density</b>	N/A	<b>Specific Gravity</b>	Sinks in water (1.35)

## 5.2.1 Safety Measures

## 5.2.1.1 Warnings

- Inhalation may cause dizziness, nausea, intestinal upset.
- Ingestion of large amounts may be harmful.
- Eye contact causes irritation, redness and tearing.
- Prolonged and repeated skin contact can cause irritation.

## 5.2.1.2 Personal Protection

- Always wear impervious, chemical-resistant clothing, gloves, footwear, and goggles (Viton and PVC are suitable materials).

## 5.2.1.3 Precautions

- Prevent from contacting water.

- Dry material can decompose explosively when confined and exposed to high temperatures.
- Keep away from organic materials since these can lower decomposition temperature.

#### 5.2.2 Response To Fires – Ammonium Nitrate

#### 5.2.3 Consider Action Only If Safety Permits!

- Wear SCBA in confined areas.
- Shut off fuel supply.
- Extinguish fire with CO<sub>2</sub>, dry chemical, alcohol foam or water fog. NOTE: Water or foam may cause frothing.
- Use water to cool containers exposed to fire.

#### 5.2.4 Response To Spills

#### 5.2.5 Consider Action Only If Safety Permits!

##### 5.2.5.1 On Land

- Block entry into waterways.
- Do not flush into ditch/drainage systems.
- Contain spill by diking with earth or other barrier.
- If liquid, remove minor spills with sorbent, large spills with pumps or vacuum equipment.
- Prill / granules can be shoveled or removed mechanically.

##### 5.2.5.2 On Water

- Ammonium nitrate sinks and mixes with water; contain spill by isolating contaminated water through damming or diversion.

- Flushing with water can be tried, if spill area cannot be isolated.

#### 5.2.5.3 Storage & Transfer

- Store closed labeled containers in cool, ventilated areas away from incompatible materials.

#### 5.2.5.4 Disposal

- Segregate waste types.
- Place contaminated materials into marked containers.
- Consult with environmental authorities during final disposal.

#### 5.2.6 First Aid – Ammonium Nitrate

##### 5.2.6.1 Eyes

- Flush eyes immediately with fresh, warm water (NOT HOT WATER) for 20 minutes while holding the eyelids open.
- Remove contact lenses, if exposed to vapours or liquid.
- Get prompt medical attention.

##### 5.2.6.2 Skin

- Remove and launder contaminated clothing.
- Wash skin thoroughly with soap and water.
- Get medical attention.

##### 5.2.6.3 Inhalation

- Move victim to fresh air.
- Perform CPR if victim is not breathing (**USE HOLGER-NIELSON METHOD AND NOT MOUTH-TO-MOUTH METHOD IF VICTIM INHALED OR INGESTED THE SUBSTANCE**).

- Provide oxygen if victim is having difficulty breathing.
- Get prompt medical attention.

#### 5.2.6.4 Ingestion

- **INDUCE VOMITING IMMEDIATELY.** If victim is conscious, give two glasses of water and stick finger down throat.
- Get prompt medical attention.

### 5.3 SPILL RESPONSE ACTION

#### 5.3.1 ANFO (Ammonium Nitrate/Fuel Oil)

- Potential Explosive - Consider Action Only If Safety Permits!
- ANFO may detonate in fire or under severe impact or confinement
- Eliminate ignition sources.
- Stop source if safe to do so.

<b>On Land</b>	<p>Do not flush into ditches or drainage systems.</p> <p>Block entry into waterways and contain with earth or other barrier(s).</p> <p>Do not contain spill if there is any chance of igniting vapours.</p> <p>If liquid, remove minor spills with sorbent and large spills with pumps or vacuum equipment.</p> <p>If prill / granules, can be shoveled or removed mechanically.</p> <p>On tundra, spread and leave as fertilizer if feasible.</p>
<b>On Snow and Ice</b>	<p>Block entry into waterways and contain with snow or other barrier.</p> <p>Remove ammonium nitrate and contaminated snow with shovels or</p>

	<p>other mechanical means.</p>
<b>On Muskeg</b>	<p>Do not deploy personnel and equipment on marsh or vegetation.</p> <p>Remove ammonium nitrate and contaminated snow with shovels or other mechanical means if feasible.</p> <p>Burning is not safe or feasible.</p> <p>Minimize damage caused by equipment and excavation.</p>
<b>On Water</b>	<p>Ammonium nitrate is water soluble and difficult to recover.</p> <p>Released oil will float to surface.</p> <p>Isolate/confine spill by damming or diversion if feasible.</p> <p>Remove oil with sorbent pads.</p> <p>Water flushing can be tried to disperse spill.</p>
<b>Storage and Transfer</b>	<p>Place collected material in water proof containers.</p> <p>Store closed labeled containers in cool, ventilated areas away from incompatible materials, e.g., oxidizable materials.</p>
<b>Disposal</b>	<p>Segregate waste types.</p> <p>Place contaminated materials into marked containers.</p> <p>Consult Environmental Coordinator on post-spill requirements.</p>

## 6 PROCESS AND WATER TREATMENT CHEMICALS

### 6.1 SULPHURIC ACID (63%)

## 6.1.1 Consider Action Only If Safety Permits!

- Evolution of explosive hydrogen gas on contact with most metals
- Stop source if safe to do so

<b>On Land</b>	<p>Do not flush into ditches or drainage systems.</p> <p>Block entry into waterways and contain with earth or other barrier(s).</p> <p>Remove small spills with dry earth, sand or fly ash.</p> <p>Neutralize with lime, limestone, sodium carbonate (soda ash), sodium bicarbonate, and dilute sodium hydroxide.</p> <p>Remove large spills with pumps or vacuum equipment after neutralization.</p>
<b>On Snow and Ice</b>	<p>Block entry into waterways.</p> <p>Do not flush into ditches or drainage systems.</p> <p>Remove minor spills with dry earth, sand or fly ash.</p> <p>Remove large spills with pumps or vacuum equipment after neutralization.</p> <p>Remove contaminated snow with shovels or mechanical equipment.</p>
<b>On Muskeg</b>	<p>Do not deploy personnel and equipment on marsh or vegetation.</p> <p>Remove pooled ferric sulfate with pumps after neutralization.</p> <p>Burning is not recommended.</p> <p>Minimize damage caused by equipment and excavation.</p>

<b>On Water</b>	<p>Isolate/confine spill by damming or diversion.</p> <p>Water flushing can be tried to disperse acid.</p> <p>Neutralization with lime or soda ash can be tried.</p>
<b>Storage and Transfer</b>	<p>Store closed labeled containers in cool, ventilated area.</p> <p>Protect containers against physical damage.</p>
<b>Disposal</b>	<p>Segregate waste types.</p> <p>Place contaminated materials into marked containers.</p> <p>Consult Environmental Coordinator on post spill requirements.</p>

## 6.2 SULPHURIC ACID (63 %)

<b>Typical Physical And Chemical Properties</b>			
<b>Appearance</b>	Clear colourless liquid	<b>Flash Point</b>	Not applicable
<b>Odour</b>	No odour	<b>Boiling Point</b>	276°C
<b>Solubility</b>	Very soluble	<b>Viscosity</b>	Not viscous
<b>Vapour Density</b>	3.4	<b>Specific Gravity</b>	1.84

### 6.2.1 Safety Measures

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### 6.2.1.1 Warnings

- Inhalation causes severe irritation to the respiratory tract, coughing, sneezing, tickling sensations in nose and throat.
- Ingestion may cause severe injury or death and perforation of the gastrointestinal tract.
- Eye contact causes severe damage which may result in sight loss.
- Reacts violently with water and fuels.

### 6.2.1.2 Personal Protection

- Always wear impervious, chemical-resistant clothing, gloves, footwear, and goggles (rubber or PVC are suitable materials).
- Use NIOSH approved full face piece respirator with cartridges (acid-gas and mists) or SCBA.

### 6.2.1.3 Precautions

- Highly reactive with materials such as metals, metal oxides, hydroxides, nitrates, amines, carbonates and other alkaline materials.
- Will react with water to produce toxic and corrosive fumes.
- Toxic fumes of oxides of sulfur when heated to decomposition.

### 6.2.2 Response To Fires – Sulphuric Acid

### 6.2.3 Consider Action Only If Safety Permits!

- Wear SCBA in confined areas.
- Do not add water to the acid.
- Extinguish fire with CO<sub>2</sub>, dry chemical or soda ash.
- Use water to cool containers exposed to fire.

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#### 6.2.4 Response to Spills

#### 6.2.5 Consider Action Only If Safety Permits!

##### 6.2.5.1 On Land

- Block entry into waterways.
- Do not flush into ditch/drainage systems.
- Contain spill by diking with earth, sand or other barrier.
- Remove minor spills with dry earth, sand or fly ash.
- Remove large spills with pumps or vacuum equipment after neutralization.
- Neutralization with lime, sodium bicarbonate (soda ash), sodium bicarbonate, or dilute sodium hydroxide.

##### 6.2.5.2 On Water

- Sulfuric acid will dissolve in water. Contain spill by isolating contaminated water through damming or diversion.
- Flushing with water can be tried, if spill area cannot be isolated.
- Neutralization with lime or sodium bicarbonate can be tried.

##### 6.2.5.3 Storage & Transfer

- Store closed labeled containers in cool, ventilated areas away from incompatible materials.
- Use proper equipment for lifting and transporting all containers.

##### 6.2.5.4 Disposal

- Segregate waste types.
- Place contaminated materials into marked containers.

- Consult with environmental authorities during final disposal.

#### 6.2.6 First Aid – Sulphuric Acid

##### 6.2.6.1 Eyes

- Flush eyes immediately with fresh, warm water (NOT HOT WATER) for 20 minutes while holding the eyelids open.
- Remove contact lenses. Cover with sterile bandages.
- Seek immediate medical attention.

##### 6.2.6.2 Skin

- Remove contaminated clothing and shoes.
- Wash skin thoroughly with plenty of water for 20 minutes.
- Seek medical attention.

##### 6.2.6.3 Inhalation

- Remove victim to fresh air.
- Perform artificial respiration only if victim is not breathing (**USE HOLGER-NIELSON METHOD AND NOT MOUTH-TO-MOUTH METHOD IF VICTIM INHALED OR INGESTED THE SUBSTANCE**).
- Provide oxygen if victim is having difficulty breathing.
- Seek immediate medical attention.

##### 6.2.6.4 Ingestion

- **DO NOT INDUCE VOMITING.** If vomiting occurs, lean victim forward to prevent breathing in vomit.
- If victim is conscious, give large amounts of water.
- Seek immediate medical attention.

## 6.3 SPILL RESPONSE ACTION

### 6.3.1 Caustic Soda (Sodium Hydroxide)

**• CONSIDER ACTION ONLY IF SAFETY PERMITS!**

- Avoid contact with caustic soda – it is a corrosive liquid
- Contact with metals may evolve flammable hydrogen gas.
- Stop source if safe to do so.

<p><b>On Land</b></p>	<p>Do not flush into ditches or drainage systems</p> <p>Block entry into waterways.</p> <p>Contain spill by diking with earth or other barrier.</p> <p>Remove minor spills with dry earth, sand or other non-combustible material.</p> <p>Remove large spills with pumps or vacuum equipment.</p> <p>Neutralization with dilute hydrochloric acid can be tried on small spills in unconfined areas. (Hydrochloric acid &lt; 1 litre is in the environmental storage cabinet.)</p>
<p><b>On Snow and Ice</b></p>	<p>Block entry into waterways and contain with snow or other barrier.</p> <p>Do not flush into ditches or drainage systems.</p> <p>Remove minor spills with dry earth, sand or other non-combustible material.</p> <p>Remove contaminated snow with shovels or other mechanical means.</p>
<p><b>On Muskeg</b></p>	<p>Do not deploy personnel and equipment on marsh or vegetation.</p> <p>Remove pooled caustic soda after neutralization with pumps.</p>

	<p>Burning is not feasible.</p> <p>Minimize damage caused by equipment and excavation.</p> <p>Low pressure water flushing can be tried if feasible.</p>
<b>On Water</b>	<p>Caustic soda sinks and mixes with water, generating heat.</p> <p>Isolate/confine spill by damming or diversion.</p> <p>Water flushing can be tried to disperse the caustic soda.</p> <p>Neutralization with dilute hydrochloric acid can also be tried.</p>
<b>Storage and Transfer</b>	<p>Place collected material in waterproof containers.</p> <p>Store closed labeled containers in cool, ventilated areas away from incompatible materials, e.g., combustible materials.</p>
<b>Disposal</b>	<p>Segregate waste types.</p> <p>Place contaminated materials into marked containers.</p> <p>Consult Environmental Coordinator on post spill requirements.</p>

#### 6.4 CAUSTIC SODA (SODIUM HYDROXIDE)

<b>Typical Physical And Chemical Properties</b>			
Appearance	White solid odourless	Flash Point	Non-flammable
Odour	Odourless	Melting Point	3180°C
Solubility	Highly soluble	Viscosity	Not applicable

Vapour Density	Not applicable	Specific Gravity	2.1
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## 6.4.1 Safety Measures

### 6.4.1.1 Warnings

- Caustic soda is a corrosive solid or liquid.
- Contact can cause severe skin burns.
- Contact with water may generate sufficient heat to ignite combustible materials.
- Eye contact causes irritation.
- Reacts violently with acids.

### 6.4.1.2 Personal Protection

- Always wear impervious, chemical-resistant clothing, gloves, footwear, and goggles specifically recommended by the manufacturer.
- Wear full-face organic vapour cartridge respirator where oxygen is adequate, otherwise wear positive pressure SCBA, if circumstances warrant.

### 6.4.1.3 Precautions

- May react with aluminum, zinc and tin metals to generate flammable and potentially explosive hydrogen gas.
- Avoid contact with strong oxidizers, such as nitric acid, sulphuric acid, chlorine, ozone, and peroxides.
- When mixing with water, add small amounts of the caustic soda slowly.
- Restrict access and work upwind of spill.

## 6.4.2 Response To Fires – Caustic Soda

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### 6.4.3 Consider Action Only If Safety Permits!

- Wear SCBA in confined areas.
- Eliminate all ignition sources.
- Extinguish fire with CO<sub>2</sub>, dry chemical, AFFF foam or water fog.
- Use water to cool containers exposed to fire.

### 6.4.4 Response to Spills

#### 6.4.5 Consider Action Only if Safety Permits!

##### 6.4.5.1 On Land

- Block entry into waterways. Do not flush into ditch/drain systems.
- Contain spill by diking with earth, sand or other barrier.
- Remove minor spills with earth, sand or vermiculite sorbent. Remove large spills in solution with pumps or vacuum equipment.
- Neutralization with dilute hydrochloric acid can also be tried

##### 6.4.5.2 On Water

- Caustic soda sinks and mixes with water generating heat.
- Isolate/confine spill by damming or diversion if feasible.
- Water flushing can be tried to disperse the caustic sodas.
- Neutralization with dilute hydrochloric acid can also be tried.

##### 6.4.5.3 Storage & Transfer

- Store closed labeled containers in cool, ventilated areas away from incompatible materials.
- Protect from contact with water.

#### 6.4.5.4 Disposal

- Place contaminated materials in segregated, marked containers.
- Consult with environmental authorities during final disposal.

#### 6.4.6 First Aid – Caustic Soda

##### 6.4.6.1 Eyes

- Flush eyes immediately with fresh, warm water (NOT HOT WATER) for 20 minutes while holding the eyelids open.
- Remove contact lenses, if exposed to vapours or liquid.
- Get prompt medical attention.

##### 6.4.6.2 Skin

- Remove and launder contaminated clothing.
- Wash skin thoroughly with soap and water.
- Get medical attention.
- Discard saturated leather articles.

##### 6.4.6.3 Inhalation

- Move victim to fresh air.
- Perform CPR if victim is not breathing.
- Provide oxygen if victim is having difficulty breathing.
- Get prompt medical attention.

##### 6.4.6.4 Ingestion

- **DO NOT INDUCE VOMITING.** If victim is conscious, give milk or water to drink. If vomiting begins, keep victim's head below hips to prevent aspiration.

- Get prompt medical attention.

## 6.5 SPILL RESPONSE ACTION

### 6.5.1 Ferric Sulphate

- Consider Action Only If Safety Permits!
- Corrosive metal salt solutions may generate hydrogen gas when contacting alkaline metals
- Stop source if safe to do so

<p><b>On Land</b></p>	<p>Do not flush into ditches or drainage systems.</p> <p>Block entry into waterways and contain with earth or other barrier(s).</p> <p>Remove small spills with dry earth, sand or fly ash.</p> <p>Neutralize with lime or soda ash.</p> <p>1000 litre totes located at PKC containment area.</p> <p>Remove large spills with pumps or vacuum equipment after neutralization.</p>
<p><b>On Snow and Ice</b></p>	<p>Block entry into waterways.</p> <p>Do not flush into ditches or drainage systems.</p> <p>Remove minor spills with dry earth, sand or fly ash.</p> <p>Remove large spills with pumps or vacuum equipment after neutralization.</p> <p>Remove contaminated snow with shovels or mechanical equipment.</p>

<b>On Muskeg</b>	<p>Do not deploy personnel and equipment on marsh or vegetation.</p> <p>Remove pooled ferric sulfate with pumps after neutralization.</p> <p>Burning is not recommended.</p> <p>Minimize damage caused by equipment and excavation.</p>
<b>On Water</b>	<p>Isolate/confine spill by damming or diversion.</p> <p>Water flushing can be tried to disperse acid.</p> <p>Neutralization with lime or soda ash can be tried.</p>
<b>Storage and Transfer</b>	<p>Store closed labeled containers in cool, ventilated area.</p> <p>Protect containers against physical damage.</p>
<b>Disposal</b>	<p>Segregate waste types.</p> <p>Place contaminated materials into marked containers.</p> <p>Consult Environmental Coordinator on post spill requirements.</p>

## 6.6 FERRIC SULPHATE

<b>Typical Physical And Chemical Properties</b>			
<b>Appearance</b>	Reddish brown solution	<b>Flash Point</b>	None
<b>Odour</b>	Slight odour	<b>Boiling Point</b>	220-235°C

<b>Solubility</b>	Completely miscible	<b>Viscosity</b>	Not available
<b>Vapour Density</b>	Not available	<b>Specific Gravity</b>	1.00 – 1.57

### 6.6.1 Safety Measures

#### 6.6.1.1 Warnings

- Use proper equipment for lifting and transporting all containers.
- Protect containers against physical damage.

#### 6.6.1.2 Personal Protection

- Always wear impervious, chemical-resistant clothing, gloves, footwear, and goggles (rubber or PVC are suitable materials).
- Chemical goggles, full-face shield, or a full-face respirator to be worn at all times when handling product.

#### 6.6.1.3 Precautions

- Dangerous and irritating sulfur dioxide fumes may be present in fire involving this substance
- Wear NIOSH approved self-contained breathing apparatus and protective clothing.

### 6.6.2 Response to Fires

#### 6.6.3 Consider Action Only If Safety Permits!

- Wear SCBA in confined areas.
- Extinguish fire with dry chemical, water spray or carbon dioxide.
- Use water to cool containers exposed to fire.

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## 6.6.4 RESPONSE TO SPILLS – FERRIC SULPHATE

### 6.6.5 Consider Action Only If Safety Permits!

#### 6.6.5.1 On Land

- Block entry into waterways.
- Do not flush into ditch/drainage systems.
- Contain spill by diking with earth, sand or other barrier.
- Remove minor spills with dry earth, sand or fly ash.
- Remove large spills with pumps or vacuum equipment after neutralization.
- Neutralization with lime or sodium bicarbonate (soda ash).

#### 6.6.5.2 On Water

- Ferric sulfate will dissolve in water. Contain spill by isolating contaminated water through damming or diversion.
- Flushing with water can be tried, if spill area cannot be isolated.
- Neutralization with lime or sodium bicarbonate can be tried.

#### 6.6.5.3 Storage & Transfer

- Store closed labeled containers in cool, ventilated areas.
- Use proper equipment for lifting and transporting all containers.
- Protect containers against physical damage.

#### 6.6.5.4 Disposal

- Segregate waste types.
- Place contaminated materials into marked containers.

- Consult with environmental authorities during final disposal.

#### 6.6.6 First Aid

##### 6.6.6.1 Eyes

- Flush eyes immediately with fresh, warm water (NOT HOT WATER) for 20 minutes while holding the eyelids open.
- Remove contact lenses. Cover with sterile bandages.
- Seek immediate medical attention.

##### 6.6.6.2 Skin

- Short duration contact may cause irritation.
- Prolonged contact may cause dermatitis and burns.
- Highly toxic by intravenous route.

##### 6.6.6.3 Inhalation

- Minimal risk due to low vapour pressure.
- Product is irritating to mucous membranes, respiratory tract, and lung tissues.

##### 6.6.6.4 Ingestion

- May produce mild to moderately severe oral and esophageal burns which could lead to liver cirrhosis and fibrosis of the pancreas.

#### 6.7 SPILL RESPONSE ACTION

##### 6.7.1 Ferrosilicon

- Consider Action Only If Safety Permits!
- May produce flammable and toxic gases on contact with water.
- Eliminate ignition sources.

- Stop source if safe to do so.

<b>On Land</b>	<p>Do not flush into ditches or drainage systems.</p> <p>Block entry into waterways.</p> <p>Contain spill by diking with earth or other barrier.</p> <p>Remove spills with shovel without generating dust.</p>
<b>On Snow and Ice</b>	<p>Block entry into waterways and contain with snow or other barrier.</p> <p>Do not flush into ditches or drainage systems.</p> <p>Contain spill by diking with snow or other barrier.</p> <p>Remove contaminated snow with shovels or other mechanical means.</p>
<b>On Muskeg</b>	<p>Do not deploy personnel and equipment on marsh or vegetation.</p> <p>Remove spilled material manually.</p> <p>Minimize damage caused by equipment and excavation.</p>
<b>On Water</b>	<p>Ferrosilicon is insoluble in water but impurities may dissolve.</p> <p>Isolate/confine spill by damming or diversion.</p> <p>Materials may generate hydrogen and acetylene gasses when exposed to water.</p>
<b>Storage and Transfer</b>	<p>Store closed labeled dry containers in cool, ventilated areas away from incompatible materials, e.g., caustic soda, acids and oxidizers.</p> <p>Do not seal damp or wet materials in containers.</p>

<b>Disposal</b>	<p>Segregate waste types.</p> <p>Place contaminated materials into marked containers.</p> <p>Consult Environmental Coordinator on post spill requirements.</p>
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## 6.8 FERROSILICON

Typical Physical And Chemical Properties			
<b>Appearance</b>	Silver powder metallic	<b>Flash Point</b>	Not applicable
<b>Odour</b>	Odourless	<b>Melting Point</b>	1275 – 13750°C
<b>Solubility</b>	Insoluble	<b>Viscosity</b>	Not applicable
<b>Vapour Density</b>	N/A	<b>Specific Gravity</b>	2.3-3.3

### 6.8.1 Safety Measures

#### 6.8.1.1 Warnings

- Material may generate hydrogen and/or acetylene when wet.
- Impurities in ferrosilicon may react with water to produce toxic arsine and phosphine.
- Dust concentrations may irritate eyes, nose, and throat.

#### 6.8.1.2 Personal Protection

- Wear protective clothing, gloves, footwear, and goggles in handling the material.
- Wear a half-mask face piece in dust conditions.

#### 6.8.1.3 Precautions

- Monitor for explosive atmosphere.
- Avoid contact with strong oxidizers, such as nitric acids especially hydrofluoric acid and caustic soda.
- Eliminate ignition sources.
- Avoid dust accumulations.

#### 6.8.2 Response to Fires

#### 6.8.3 Consider Action Only If Safety Permits!

- Wear SCBA in confined areas.
- Shut off fuel supply.
- Extinguish fire with CO<sub>2</sub>, dry chemical, alcohol foam or water fog.

#### 6.8.4 Response to Spills – Ferrosilicon

#### 6.8.5 Consider Action Only If Safety Permits!

##### 6.8.5.1 On Land

- **ELIMINATE IGNITION SOURCES.**
- Block entry into waterways. Do not flush into ditch/drain systems.
- Contain spill by diking with earth, snow or other barrier.
- Remove spills with shovel without generating dust.

##### 6.8.5.2 On Water

- Ferrosilicon is insoluble in water but impurities may dissolve.
- Isolate/confine spill by damming or diversion.
- Material may generate hydrogen and acetylene gases when exposed to water.

#### 6.8.5.3 Storage & Transfer

- Store closed labeled containers in cool, ventilated areas away from water, acids and hydroxides.
- Do not seal damp or wet materials in containers.

#### 6.8.5.4 Disposal

- Place contaminated materials in segregated, marked containers.
- Consult with environmental authorities during final disposal.

#### 6.8.6 First Aid

##### 6.8.6.1 Eyes

- Flush eyes immediately with fresh, warm water (NOT HOT WATER) for 20 minutes while holding the eyelids open.
- Remove contact lenses, if exposed to vapours or liquid.
- Get prompt medical attention.

##### 6.8.6.2 Skin

- Remove and launder contaminated clothing.
- Wash skin thoroughly with soap and water.

##### 6.8.6.3 Inhalation

- Move victim to fresh air.
- Perform artificial resuscitation if victim is not breathing.

- Provide oxygen if victim is having difficulty breathing.
- Get prompt medical attention.

## 6.9 SPILL RESPONSE ACTION

### 6.9.1 Magnafloc Flocculants

- Consider Action Only If Safety Permits!
- Magnafloc 368 and 1011 have similar properties
- Spilled solutions within the Processing and Water Treatment Plants can create a hazard because of their slippery nature.

<b>On Land</b>	<p>Do not flush into ditches or drainage systems.</p> <p>Prevent contact with water and block entry into waterways.</p> <p>Contain spill by diking with earth or other barrier.</p> <p>Attempt to avoid wetting any spills of the dry white granular powder.</p> <p>Remove minor spills with shovels.</p> <p>Remove large spills with mechanical means.</p>
<b>On Snow and Ice</b>	<p>Block entry into waterways and contain with snow or other barrier.</p> <p>Do not flush into ditches or drainage systems.</p> <p>Remove contaminated snow with shovels or other mechanical means.</p>
<b>On Muskeg</b>	<p>Do not deploy personnel and equipment on marsh or vegetation.</p> <p>Remove accumulations with shovels.</p> <p>Burning is not feasible.</p> <p>Minimize damage caused by equipment and excavation.</p>
<b>On Water</b>	<p>Flocculants are soluble in water.</p> <p>Isolate/confine spill by damming or diversion.</p>
<b>Storage and Transfer</b>	<p>Place collected material in water proof containers.</p> <p>Store closed labeled containers in cool, ventilated areas away from incompatible materials, e.g., combustible materials.</p>
<b>Disposal</b>	<p>Segregate waste types.</p> <p>Place contaminated materials into marked containers.</p> <p>Consult Environmental Coordinator on post-spill requirements.</p>

## 6.10 MAGNAFLOC

<b>Typical Physical And Chemical Properties</b>			
The Kimberlite Processing Plant and Water Treatment Plant use two polymer flocculants, Magnafloc 368 and Magnafloc 1011, which have similar physical and chemical properties.			
Appearance	White or off-white powders	Flash Point	None exhibited
Odour	Not significant	Freezing Point	Not available
Solubility	Soluble	Viscosity	Low (100-300 Cst) in concentration <1%
Ph Of 1% Solution	6.0-7.0	Specific Gravity	0.75-1.0

### 6.10.1 Safety Measures

#### 6.10.1.1 Warnings

- Dust can gather, mix with air and become explosive.
- Inhalation of dust may be irritating to respiratory system.
- Avoid contact with strong oxidants.
- Eye contact may cause irritation, redness.
- Prolonged and repeated contact can cause mild irritation.
- Inhalation of vapours can cause irritation of the respiratory tract, headache, vomiting, and unconsciousness.

#### 6.10.1.2 Personal Protection

- Use dust mask, chemical-resistant clothing, gloves, footwear, and goggles.

#### 6.10.1.3 Precautions

- Minimize breathing dust.
- Spilled solutions can create a hazard because of their slippery nature.
- Avoid contact with strong oxidizers, such as nitric acid, sulphuric acid, chlorine, ozone, and peroxides.

### 6.10.2 Response to Releases – Magnafloc

#### 6.10.3 Consider Action Only If Safety Permits!

- Keep away from sources of ignition.

- Products are stable and will not react violently with water.
- Extinguish fire with CO<sub>2</sub>, dry chemical, alcohol foam in preference to a water spray.

#### 6.10.4 RESPONSE TO RELEASES - Magnafloc

#### 6.10.5 Consider Action Only If Safety Permits!

##### 6.10.5.1 On Land

- Block entry into waterways.
- Do not flush into ditch/drainage systems.
- Contain spill by diking with earth, snow or other barrier.
- Powder can be shoveled or removed mechanically.

##### 6.10.5.2 On Water

- Flocculants are soluble in water.
- Isolate/confine spill by damming or diversion.
- Flushing with water can be tried, if spill area cannot be contained or isolated.

##### 6.10.5.3 Storage & Transfer

- Store closed labeled containers in cool, ventilated areas away from incompatible materials.

##### 6.10.5.4 Disposal

- Segregate waste types.
- Place contaminated materials into marked containers.

- Consult with environmental authorities during final disposal.

#### 6.10.6 First Aid – Magnafloc

##### 6.10.6.1 Eyes

- Flush eyes immediately with fresh, warm water (NOT HOT WATER) for 20 minutes while holding the eyelids open.
- Remove contact lenses, if exposed to liquid solutions.
- Get prompt medical attention.

##### 6.10.6.2 Skin

- Remove contaminated clothing.
- Wash skin thoroughly with soap and water.
- Get medical attention.

##### 6.10.6.3 Inhalation

- Move victim to fresh air.
- Perform CPR if victim is not breathing.
- Provide oxygen if victim is having difficulty breathing.
- Get prompt medical attention.

##### 6.10.6.4 Ingestion

- If ingested, do not induce vomiting. Remove product from mouth and seek medical attention.
- Get prompt medical attention.

7 EFFLUENT AND SLURRIES

7.1 SPILL RESPONSE ACTION

7.1.1 Raw Sewage

• **CONSIDER ACTION ONLY IF SAFETY PERMITS!**

- Avoid direct contact with raw sewage.

<p><b>On Land</b></p>	<p>Do not flush into ditches or drainage systems.</p> <p>Block entry into waterways.</p> <p>Contain spill by diking with earth or other barrier.</p> <p>Remove spills with pumps or vacuum equipment.</p> <p>On tundra use peat moss and leave in place to degrade, if feasible.</p>
<p><b>On Snow and Ice</b></p>	<p>Block entry into waterways and contain with snow or other barrier.</p> <p>Do not flush into ditches or drainage systems.</p> <p>Remove contaminated snow with shovels or other mechanical means.</p>
<p><b>On Muskeg</b></p>	<p>Do not deploy personnel and equipment on marsh or vegetation.</p> <p>Remove pooled sewage with pumps or vacuum equipment.</p> <p>Minimize damage caused by equipment and excavation.</p>

<b>On Water</b>	<p>Not a likely scenario as all sewage is contained ~ 900 metres from water body; solid fractions would be retained on boulder/gravel surface while liquid fraction would be diluted in receptor water body.</p> <p>Isolate/confine spill by damming or diversion.</p> <p>If not possible to confine and pump, disperse using water flushing.</p>
<b>Storage and Transfer</b>	<p>Store closed labeled containers in cool, ventilated areas.</p> <p>Avoid contact with collected material.</p>
<b>Disposal</b>	<p>Place contaminated materials into marked containers.</p> <p>Transport to the sewage treatment plant.</p> <p>Consult Environmental Manager or Environmental Consultant on post-spill requirements.</p>

## 7.2 RAW SEWAGE

<b>Typical Physical And Chemical Properties</b>			
Appearance	Brown to black liquid	Flash Point	N/A
Odour	Pungent, foul	Pour Point	0-100°C
Solubility	Partly soluble	Viscosity	Variable

Vapour Density	N/A	Specific Gravity	1.2-1.5
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## 7.2.1 Safety Measures

### 7.2.1.1 Warnings

- Inhalation of fumes can cause nausea.
- Ingestion may be harmful.
- Eye contact causes irritation.
- Repeated skin contact can cause irritation.

### 7.2.1.2 Personal Protection

- Always wear impervious, chemical-resistant clothing, gloves, footwear, and goggles. PVC is suitable.

### 7.2.1.3 Precautions

- Prevent from contacting water.
- Keep personnel away from spill area.
- Demarcate area and keep vehicles, equipment away.

## 7.2.2 Response to Fires

### 7.2.3 Consider Action Only If Safety Permits!

- Fire is unlikely to affect sewage.

#### 7.2.4 Response to Spills – Raw Sewage

#### 7.2.5 Consider Action Only If Safety Permits!

##### 7.2.5.1 On Land

- Block entry into waterways.
- Do not flush into ditch/drainage systems.
- Contain spill by diking with earth, snow or other barrier.
- Remove minor and large spills with pumps or vacuum equipment.

##### 7.2.5.2 On Water

- Raw sewage sinks and mixes with water. Contain spill by isolating contaminated water through damming or diversion.

##### 7.2.5.3 Storage & Transfer

- Store closed labeled containers in cool, ventilated areas away from incompatible materials and equipment.

##### 7.2.5.4 Disposal

- Segregate waste types.
- Place contaminated materials into marked containers.
- Consult with environmental authorities during final disposal.

#### 7.2.6 First Aid

##### 7.2.6.1 Eyes

- Flush eyes immediately with fresh, warm water (NOT HOT WATER) for 20 minutes while holding the eyelids open.

- Remove contact lenses, if exposed to liquid.
- Get prompt medical attention.

#### 7.2.6.2 Skin

- Remove and contaminated clothing.
- Wash skin thoroughly with soap and water.
- Get medical attention.

#### 7.2.6.3 Inhalation

- Move victim to fresh air.
- Perform CPR if victim is not breathing (**USE HOLGER-NIELSON METHOD AND NOT MOUTH-TO-MOUTH METHOD IF VICTIM INHALED OR INGESTED THE SUBSTANCE**).
- Provide oxygen if victim is having difficulty breathing.
- Get prompt medical attention.

#### 7.2.6.4 Ingestion

- **INDUCE VOMITING IMMEDIATELY** if victim is conscious, give two glasses of water and stick finger down throat.
- Get prompt medical attention.



### Appendix C Spill Volumes that must be reported to the Government of the Northwest Territories

• Transportation of Dangerous Goods Class	• Description of Contaminant	• Amount Spilled
1	explosives	any amount
2.1	compressed gas (flammable)	any amount of gas from containers with a capacity greater than 100 L or if it comes into contact with water
2.2	compressed gas (non-corrosive, non flammable)	any amount of gas from containers with a capacity greater than 100 L or if it comes into contact with water
2.3	compressed gas (toxic)	any amount
2.4	compressed gas (corrosive)	any amount
3.1, 3.2, 3.3	flammable liquid	100 L
4.1	flammable solid	25 kg
4.2	spontaneously combustible solids	25 kg
4.3	Water reactant solids	25 kg
5.1	oxidizing substances	50 L or 50 kg
5.2	organic peroxides	1 L or 1 kg
6.1	poisonous substances	5 L or 5 kg
6.2	infectious substances	any amount
7	radioactive substances	any amount
8	corrosive substances	5 L or 5 kg
9.1 (in part)	miscellaneous product or substances, excluding PCB mixtures	50 L or 50 kg
9.2	environmentally hazardous	1 L or 1 kg
9.3	dangerous wastes	5 L or 5 kg
9.1 (in part)	PCB mixtures of 5 or more parts per million	0.5 L or 0.5 kg
None	other contaminants	100 L or 100 kg

Note: L = litre; kg = kilogram; PCB = polychlorinated biphenyls.

## Appendix D Hazardous Materials Potentially Stored at Site for Mine Operations

Material	Site Category	Approximate Amount	Storage Location
Diesel fuel	POL	40,000,000 litres	Tank Farm
Gasoline	POL	2,500 litres	Adjacent Enviro Shop
Gear Oils and Lubricants	POL	150,000 litres 150,000 litres	- Lay down Area 1 - Services Complex
Jet-B Fuel	POL	5,000 litres	Haz Cell (Waste Management Area)
Emulsion (AN + SN + oil phase)	Explosives	10,000 kg 30,000 kg	- Emulsion Plant - U/G Explosives Area
Ammonium Nitrate	Explosives	1,500,000 kg	AN Storage Building
Sodium Nitrate	Explosives	15,000 kg	AN Storage Pad
Detonator Caps and Delays	Explosives	500,000 units	U/G Explosives Mag
Tentex Boosters	Explosives	500,000 units	U/G Explosives Mag
Windshield Washer Fluid	Other Hazardous Materials	500 litres 100 litres	- Warehouse - Services Complex
Fuel Conditioner	Other Hazardous Materials	800 litres 200 litres	- Warehouse - Services Complex
Propylene Glycol	Other Hazardous Materials	5,000 litres	Laydown Area 1
Ethylene Glycol	Other Hazardous Materials	25,000 litres	Laydown Area 1
Propane	Other Hazardous Materials	50 ea (20 lbs) bottles	Laydown Area 1
Acetylene	Other Hazardous Materials	200 bottles	Laydown Area 1
Oxygen	Other Hazardous Materials	500 bottles	Laydown Area 1
Paint	Other Hazardous Materials	500 litres	Laydown Area 1
Solvents	Other Hazardous Materials	500 litres	Laydown Area 1
Sulphuric Acid (Batteries)	Other Hazardous Materials	50 litres	Laydown Area 1
Sulphuric Acid (water treatment)	Other Hazardous Materials	100,000 litres	Outside Utilities Bldg.

Material	Site Category	Approximate Amount	Storage Location
Lime	Other Hazardous Materials	400 kg	Sewage Treatment Plant # 2
Sodium Hypochlorite (12%)	Other Hazardous Materials	1,200 litres	Potable Water Plant
Cement	Other Hazardous Materials	10,000 tonnes	Laydown Area 1
Concrete Additives	Other Hazardous Materials	2,000 litres	Laydown Area 1
Curing Compounds	Other Hazardous Materials	100 litres	Laydown Area 1
Flocculants	Other Hazardous Materials	20 tonnes	- Process Plant
		20 tonnes	- Water Treatment Plant
Ferric Sulphate	Other Hazardous Materials	2,200 kg	Water Treatment Plant.
Ferrosilicon	Other Hazardous Materials	1000 tonnes	Process Plant
Sodium Hydroxide	Other Hazardous Materials	20,000 litres	Laydown Area 1
Alum	Other Hazardous Materials	3,000 litres	Laydown Area 1

Note: This table summarizes the hazardous materials that will be stored in significant or bulk quantities. A full inventory of these materials, along with minor amounts of miscellaneous hazardous materials, organized by storage location, will be maintained by the De Beers.