SLEMA

Review of the Spill Contingency Plan and Emergency Response Plan
Issued April 2007 and May 2007 Respectively

July 2007

EMERGENCY PREPAREDNESS PLAN MAY 2007

SLEMA reviewed this plan and find that as this plan deals almost entirely with work site safety in regards to human safety, and the procedures in dealing with disaster type scenarios this lies mostly outside the scope of SLEMA's mandate to make comment. The only exceptions to this are the Spill response Procedure on page 123 of the document and the forms dealing with Wildlife on pages 124 to 145. The form on spill response, on page 123, appears to be lacking details. Seeing as these details are present in very clear and comprehensive details in the Spill Contingency Plan this is not a serious concern. Perhaps there should be a section linking or directing readers to the Spill Contingency Plan.

On page 139 it lays out the training required for an Emergency Response Team member who is to deal with a problem wildlife occurrence. The last training requirement required is a Canadian Possession Acquisition License (PAL). In professions that utilize firearms in the course of their duties this license is not considered adequate for addressing liability. The training required to obtain a PAL does not assess proficiency only safe handling of Firearms. To address this, De Beers should enroll the ERT members in a program that would teach and assess general shooting techniques, maintenance of the specific firearm issued, and finally proficiency with the firearm issued. The firearm and ammunition of choice specified in this plan are shotguns loaded with slugs. The use of shotguns are a good choice, but require specialized training as they have limited effective range and accuracy when compared with rifles in the .308 Win. or 30-06 class.

This makes specialized training critical. Enforcement Agencies such as the RCMP, Provincial and City Police as well as most Provincial and Territorial Conservation Officers are required to be certified by a Basic Firearms Instructor, who holds an RCMP certification.

SPILL CONTIGENCY PLAN APRIL 2007

It should be clearly understood that this review and/or acceptance of De Beers' spill contingency plan does not absolve De Beers Canada Inc. from their responsibilities pertaining to the proper management of the hazardous materials under their control; nor does it confer upon the reviewers, any responsibility whatsoever for any errors or omissions in the spill plan and that may have been overlooked by the reviewers.

Section 2.1 Emergency/Spill Response Contact Information

De Beers provides a lengthy list of 24 hour contact numbers which is useful, however, it is suggested that they further refine this by highlighting 3 - 5 names/24 hr contacts, in order of importance. On that note, can it be assumed that the list provided is in some kind of hierarchical order?

Section 2.2 Mobile Environmental Response Unit (Off-Site)

De Beers' third party spill response firm – Petro Canada Emergency Response Group – is based out of Yellowknife, and therefore may not be immediately available to respond to spills at the Snap Lake site.

De Beers should provide the following information:

Expected Response Time: How long will it take for Petro-Canada to respond to an emergency at Snap Lake? It is not enough to have a firm on standby: the response must be timely, effective and efficient. These are the underlying and fundamental principles which govern a successful spill response operation.
Method of Deployment: how will the men and equipment be deployed to the site?

Qualifications and Experience of Response Team: the response team is expected to be experienced and properly trained. De Beers should provide an overall description of the firm's experience and track record.

Available Equipment: a description of the equipment available to the response team and which will be mobilized to the spill site.

Finally, can De Beers provide a brief description of the circumstances under which they envision the need to request outside assistance?

Section 2.3.1, First Responders

The following bullet should be added to the list of first responders' action items:

- Secure the area, keep all unnecessary/unauthorized personnel out until the hazards can be assessed.

Section 2.5.1, Training - Introduction

The personnel who will be conducting the annual training should be identified, by name, along with a brief description of their area of spills/emergency response expertise and training.

Section 2.5.2, Spill Response Training

A list of equipment is provided in the first paragraph. Is there any instrumentation, such as photo-ionization detectors ("gas sniffers") available to the response team?

De Beers should provide a detailed description of the spill response training that will be delivered to their emergency responders. As a minimum, De Beers should provide a copy of the course outline/topics covered during the course as well as specify the duration of the course. The qualifications and background of the instructor(s) should also be provided. This information is useful to regulatory agencies in that it allows them to determine how well-prepared De Beers is to manage hazardous materials spills based on the nature of the spill response training provided to their staff.

It is further suggested that De Beers' provide a list of the names of the trained responders.

Is the intended training mentioned in 2.5.2 and 2.5.3 based on any approved Federal Courses? For example Canadian Coast Guard offers a host of courses for example;

Basics of Oil Spill Response Course (BOSRC)

Marine Spill Response Operations Course (MSROC)

On-Scene Commanders Course (OSCC)

Pollution Prevention Officer Course (PPOC)

Marine Oil Spill shoreline Worker's Safety Course

Exercise Planning, Conduct and Evaluation Course

For details on these course please review this web site

http://www.ccg-gcc.gc.ca/er-ie/docs/Preparedness/Training/training_e.htm

Fuel Handlers should be fully trained in both the operation of facilities, as specified, and equipment. The training should emphasis strongly that while in the process of transferring fuel that the fuel handler, who is fully trained in this equipment, should not leave this equipment unattended for any reason while fuel is being transferred.

Section 3, Clean Up Strategies

This section makes reference to a land-farm design that is currently under development. Upon completion, the landfill design as well as other details, such as, but not restricted to, capacity, treatment capability, control structures etc., should be appended to the spill plan.

The reviewer suggests that De Beers' seriously consider constructing containment structures to manage large volumes of contaminated snow and ice, which, in the reviewer's experience, tends to be both problematic and expensive. The reviewer is aware of several case histories where the spill clean up costs reached into the hundreds of thousands of dollars, and more recently, into the millions of dollars and where these high costs were primarily driven by a lack of adequate storage/treatment facilities for contaminated snow.

The reviewer is aware of a document published in 1995 by the former GNWT Department Renewable Resources, now the Department of Environment and Natural Resources (DENR) entitled: *Generic Plans and Operating Procedures of a Remediation Facility for Hydrocarbon Contaminated Materials in the NWT* (August 1995). De Beers is advised to contact GNWT-DENR directly.

Section 4, Site Information....

De Beers should provide the geographic coordinates (Lat-Long & UTM) for the site and the approximate area covered by the site.

The map provided with the current spill plan is difficult to read and does not provide sufficient information required for a basic spill response plan. Spill plan maps should lend themselves to reproduction in a legible hard-copy format.

The final spill plan should include a site map of sufficient scale to show buildings, contaminants storage areas, spill cleanup equipment locations, likely pathways of flow (in the event of a spill) significant topographic features such as bodies of water, hills and valleys, and environmentally sensitive areas. In this case, given the large footprint of the Snap Lake mine site, it may be necessary to include, in addition to a master general map of the entire site, a series of smaller maps which cover specific sectors of the camp and mine site. It should also be kept in mind that it may be necessary to refer to these maps under less-than-ideal conditions, such as outdoors in inclement weather, therefore, they should be easy to manipulate.

De Beers should provide a physical description of the topography and terrain in and around the mine site. Consideration should be given to how the local geography will affect the movement of contaminants and how it will affect De Beers' ability to respond to a spill incident.

Information on soil types, climate, weather patterns and any other physical characteristics which can affect a spill cleanup operation should also be described in the plan.

It is possible that the above-requested information has already been provided in other related documents submitted by De Beers, however, a spill response plan should be a stand-alone document, therefore any pertinent information relating to spills and spill cleanup operations should be included in the plan.

Section 4.2 Fuel Storage and Transfer Systems

The reviewer offers the following pollution prevention suggestions:

<u>Drums</u>

Caches of drummed fuel are particularly subject to spillage because they often become buried in snowdrifts and are thus susceptible to damage from heavy equipment; most commonly, front end loaders. Furthermore, once buried, leaking containers cannot be detected until after the snow melts, by which time, most, if not all, of the spilled material has escaped off site with the spring melt. Drum cache locations should be clearly defined and marked so that they are visible even during the winter season.

To prevent spreading in the event of a spill, fuel stored in drums should be located, whenever practical, in a natural depression a minimum distance of 30 meters from all streams, preferably in an area of low permeability. All fuel

storage drums should be situated in a manner that allows easy access and inspection as well as removal of drums in the event of leaks or spills. Large fuel caches in excess of 20 drums, should be inspected daily. Additionally, De Beers is strongly advised to keep a written log of the inspections. For long term storage (> 6 months), it is strongly recommended that drummed fuel be stored on pallets to prevent the bottoms from rusting out.

Drum caches should ideally be enclosed in a fenced-in compound to prevent unauthorized access.

The above suggestions also apply to drums of hazardous materials other than fuel.

Heating Fuel Tank Installations
All heating fuel tanks, connectors and associated plumbing should be installed in a manner that meets current acceptable codes for the installation of such appliances. Fuel tanks should be situated on solid platforms, on a stable base, and should be inspected on a regular basis for leaks and movement (shifting). Flex connectors, if used, should be installed as per manufacturer's instructions and should be inspected regularly. It should be noted that many spills in the north result from improperly installed and maintained heating fuel tanks and especially flex connectors. The cautionary notes on flex connectors apply to all fuel storage facilities.

4.2.1 Fuel Storage and Transfer System Spill Preventative Measures:

It is mentioned in this section “Training in Fuel Handling operations (Manned at all times). This is a good start, but human error usually resulting from neglect is the cause of the majority of large volume fuel spills, far more often then caused by equipment failure. For this reason this needs to be more clear. It should include Training in Fuel Handling operations “and equipment”. And that the equipment should not be left unattended for any reason while transfer is taking place. The attendant should also be the person who is fully trained in the operation of the equipment. A substitute attendant should be strictly forbidden unless he/she is also fully trained in the operation and equipment. I would also like to recommend that possibly two fully trained attendants should be present at all times during the transfer of fuel. This would add a level of safety should one attendant become sick or incapacitated from the fumes (something I have witnessed) and also increase accountability for safe practices.

4.3 Chemical and Explosive storage and Transfer systems

-Do strategically located spill kits also contain neutralizing agents for dealing with caustic substances? It is not listed as an item in the spill kits. Possibly this should be included in spill kits that are near caustic chemical storage areas.

Section 4.5.1 Water Treatment Plant

Reference is made to a temporary filtration plant that: "...was constructed in 2004 and is expected to operate until 2006...." This particular section should be updated with information provided on the status of the water treatment plant as of 2007.

Section 4.5.3, Water Management Pond

A diagram/drawing and/or photograph of this facility would be helpful to reviewers.

Section 4.5.4, Water Management Pond – System Failure Response Actions

This section states: "*In the event that capacity problems in the WMP are encountered, the dam crests could be raised to a safe level/elevation."* It is not clear to the reviewer if De Beers is referring to raising water levels or adding to the height of the dam. If the latter, how much higher can the dam be raised and how much more capacity does this provide?

<u>Catastrophic Failure of Retaining Structures</u>

It is presumed that De Beers has consulted the Canadian Dam Association's *Canadian Dam Safety Guidelines* paying particular attention to section 3.0, Operation, Maintenance and Surveillance (OM&S) and Section 4.0, Emergency Preparedness. The OM&S provides the design criteria and designated trigger levels for various levels of action. The Emergency Preparedness section outlines what action should be taken in each case.

The reviewer presumes that the possibility of a catastrophic dam failure is low, however, it is not unreasonable to expect De Beers to describe how they would react to a catastrophic dam failure and subsequent release of tailings. De Beers has described this to some extent in their spill plan, however, it is suggested that De Beers conduct a table-top exercise involving mine management, heavy equipment operators, engineers, first responders and any other personnel that are likely to be called upon to assist. De Beers should consider, but not necessarily restrict themselves to, the following:

- Describe the probable extent of the downstream inundation.
- Describe the local impacts of a sudden release of tailings.
- Is human health and safety at risk?

- What immediate steps would De Beers take to minimize/mitigate possible environmental damage?

- Notification of downstream users and communities (if applicable).

- Chemical and physical characterization of the released tailings.

- Describe the follow-up sampling program that would be employed to determine the extent of the contamination.

- How would De Beers go about assessing the damage to fish and wildlife habitat?

- Is there likely to be any wildlife (including fish and birds) fatalities as a result of an accidental tailings release?

- How would De Beers go about effecting the clean up and remediation of the impacted areas?

Section 4.6.1 Sewage Treatment System – Spill Preventative Measures

This section suggests that in the event of an upset in the treatment system, *"...discharge of raw or partially treated sewage would be directed into wetlands to provide tertiary treatment prior to reaching Snap Lake..."*

How effective would this method be in the dead of winter when the raw sewage would be discharged over a frozen field of snow/ice?

Section 5.1.2 (Spill Response Action Plans) Basic Procedures

A bullet should be added to this section:

- Secure the area, keep all unnecessary/unauthorized persons away until the hazards can be assessed.

<u>Personal Protective Equipment</u>

A section should be added to address the care and maintenance of personal protective equipment

The spill plan should include the actual quantities of personal protective equipment to be deployed at the various locations. Enough personal protective equipment should be available for at least the number of personnel expected to respond to a situation, plus a few extras for backup. While the reviewer is stating the obvious, it is nonetheless worth pointing out that the level of protection afforded by personal protective equipment should be sufficient to meet the hazards presented by the material of concern.

Personnel protective equipment should be inventoried and inspected on a regular basis to ensure that it is in good working order, clean, and free from damage and wear. Damaged and/or worn equipment should be immediately replaced. Generally, personal protective equipment, particularly specialized equipment such as chemical suits and SCBA, should be kept in a designated storage area, such as a cabinet or locker, and should never be used for anything other than practice drills and responding to actual emergencies.

The reviewer may have missed it, but there appears to be no reference to photo-ionization detectors and intrinsically-safe radio/communications equipment for use in potentially explosive atmospheres (such as a gasoline spill).

Decontamination

De Beers should be prepared to describe the decontamination process in greater detail, including, but not restricted to: how will the wash medium – whether it be water or solvent based – be treated and/or disposed of? Does De Beers have portable decontamination equipment that can be erected anywhere on site (ideally the decontamination facility would have to be as close to the incident as practicable). This would be of particular significance during the winter months.

Section 5.2, Spill Response Action Plans - General

Under the heading: “Respond Safely”, the spill plan advises the responders not to contain gasoline spills as the vapours may ignite. An argument could be made that by allowing the gasoline to spread, there is a risk of a fire/explosion over a wider area. In the final analysis, this is a decision best made by the on-scene commander who would assess situation based on the circumstances at the time of the incident. It is suggested that one of the safest and effective ways to deal with a gasoline spill is to knock the fumes down with aqueous film-forming foam (AFFF).

Section 5.2.1 Action Plan for Liquid Spills on Land

There are several useful and innovative devices available for responding to spills of liquid materials including a squeegee device that fits over top of a 45 gallon drum and which squeezes fuel products from absorbent pads so that they can be re-used. Another device converts a 45 gallon drum into a powerful wet-dry shop vacuum.

Section 5.2.3, Action Plan for Fuel Spills on Snow

It is worth repeating here what was already suggested for Section 3 of the spill plan: De Beers’ should seriously consider building containment structures to

manage large volumes of contaminated snow and ice. The reviewer suggests that De Beers obtain a copy the aforementioned GNWT Department of Environment and Natural Resources' *Generic Plans and Operating Procedures of a Remediation Facility for Hydrocarbon Contaminated Materials in the NWT*.

Section 5.2.4, Action Plan for Fuel Spills on Ice

The heading for this section should be altered to include "under ice". Spills on and under ice are difficult to manage and often times, conventional spill cleanup methods are ineffective in this medium. Environment Canada has, over the last few decades, conducted extensive research on spills management in all kinds of conditions. De Beers is advised to contact Environment Canada's Yellowknife office to take advantage of the latter's vast experience in this field.

Section 6, Spill Response Equipment Available On-Site

Missing from the list of equipment included in the spill kits: hand tools, such as shovels, pick axes and the like. It is also suggested that used 45 gallon drums make very effective and inexpensive containers for contaminated materials. On that note, each kit should include a drum de-header and a few extra empty drums.

Appendix A, Spill Response Sheets and Physical and Chemical Information

Section 1.2 Gasoline

- The flash point of gasoline is not minus 500 degrees C as indicated by the table; it is closer to minus 43 degrees C.

- It is worth noting that some of the more toxic components of gasoline are water-soluble.

- Section 1.2.3.1, 4th bullet states that spills of gasoline should be contained by dyking. This contradicts the advice provided in Section 5.2 which states that spills of gasoline <u>not</u> be contained.

Section 1.3 Jet A-1

- The flash point of Jet A-1 ranges from plus 38 to plus 65 degrees C and <u>not</u> minus 38 degrees C as stated in the data sheet.

- The data sheet refers to the "freezing point". The figure provided (minus 47 degrees C) suggests that they are referring to the "gel" or "pour point".

- The specific gravity of Jet A-1 is around 0.8

Section 1.4 Jet B

- The flash point of Jet B generally ranges from minus 1 to minus 20 degrees C, depending upon the naphtha to kerosene ratio of the fuel. That being said, it is probably more prudent to assume that it is, as stated in the chemical properties table, minus 38 degrees C.

- The specific gravity of Jet B is around 0.76

- The table refers to “freezing point” when it may intend to refer to gel or pour point. The number provided – minus 47 C – seems high. Given the high naphtha content, the reviewer suggests that the pour point may be much lower than minus 47 degrees C.

- It is worth noting that many people mistakenly and dangerously equate Jet A with Jet B. The latter is far more explosive than Jet A and for all intents and purposes, should be treated with the same caution as one would gasoline. The reviewer is aware of at least one case where lives were lost because the victims assumed that Jet B and Jet A are one in the same.

Section 1.5 Diesel

- The flash point is given as plus 400 degrees C. This figure exceeds even the auto-ignition temperature of diesel (257 degrees C). The flash point of diesel is closer to plus 45 degrees C (for P-50 heating fuel).

Section 2.4 Waste Oil

- The flash point for waste oil is given as plus 100 - 2000 degrees C. The latter figure seems to be excessive (500 degrees above the melting point of iron). These figures should be verified.

- The specific gravity is given as 0.9, which in most cases, is true, however, the reviewer has seen instances where the SG of waste oil was > 1, as evidenced by the fact that it sunk in water. In other words, the reviewer suggests that De Beers assume a worst case scenario when managing spills of used oil.

General Comments on Appendix A

The physical data tables for the hazardous materials should be expanded to include the following information:

- TDGR class (1 - 9)
- UN number
- Chemical name (where applicable)
- Toxicity Data, including but not necessarily restricted to: TWA, TLV, STEL, LC_{50}, LD_{50}
- A short list of incompatible chemicals
- Upper and Lower Explosion Limits (where applicable)
- Auto ignition temperature (more of a concern to fire fighters)

Some of the information presented in the tables appears to be too generic; for example, the table in section 4.3 states that liquid propane will float on water. With a boiling point of approximately minus 42 degrees C, it is highly unlikely that one would have to concern oneself with whether or not propane would float or sink in water, the latter which, in any case, would be quite frozen at those temperatures. Also, to the best of the reviewer's knowledge, it may not be possible to ingest gases such as propane and acetylene.

Enough errors were found in the physical and chemical information sheets to suggest that De Beers should carefully and with greater attention to detail, review all of the data sheets to ensure that the information presented is accurate and relevant.

Appendix B, Government of the NWT Spill Report Form

The form provided in Appendix B is outdated. An interactive electronic form is now available from environmental regulatory agencies across the north. The reviewer has attached a copy of the updated spill reporting form as well as instructions for filling out the form.

General Comments:

While De Beers has provided an appendix with a list of chemicals and physical data (albeit some of it incorrect) it would be helpful to reviewers if De Beers would provide a spreadsheet with a list of hazardous materials present on site as well as the estimated quantities of each.

De Beers should be advised that if they intend to store hazardous waste on site for > 180 days, they are required to register with GNWT-DENR as a hazardous waste storage facility. Furthermore, they must also apply for a Hazardous Waste Generator Number if they intend to offer hazardous waste for transport. De Beers is referred to the GNWT *Guideline for the General Management of Hazardous Waste*.

Suggested Reference Material:

The following is a list of reference material which De Beers may find useful in compiling their final spill contingency plan:

- Environment Canada (Tilden & Westerman). 1990. *Guidelines for the Preparation of Hazardous Material Spill Contingency Plans*.
- Government of the Northwest Territories. 1993. *Spill Contingency Planning and Reporting Regulations*
- Government of the Northwest Territories. 2002. *A Guide to the Spill Contingency Planning and Reporting Regulations*
- Government of the Northwest Territories. 2003. *Environmental Guideline for Contaminated Site Remediation*.

- Government of the Northwest Territories. 1997. *Spill Containment and Cleanup Course*.
- Indian and Northern Affairs Canada. 2005. *DEW Line Cleanup Barrel Protocol*
- Fingas, Merv. 2001. *The Basics of Oil Spill Cleanup*

Closing Comments:

Overall, De Beers' spill plan as presented, appears to be reasonably complete and demonstrates that De Beers has given some thought to spill prevention, response and cleanup. As with any other spill plan, this will be an evolving document and therefore should be updated yearly and/or as changing circumstances warrant.

The reviewer has, in addition to identifying deficiencies in the plan, also provided what he believes to be constructive advice which is intended to improve upon De Beers' existing plan.