Snap Lake Environmental Monitoring Agency
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Jen Potten
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File: MV2011L2-0004

October 18, 2011

RE: Water Licence Renewal

Dear Ms. Potten,

The Snap Lake Environmental Monitoring Agency (SLEMA) would like to provide the Mackenzie Valley Land and Water Board (MVLWB) with the following comments related to De Beers Snap Lake Diamond Mine Water Licence Renewal.

1. Water Quality Objectives

- TDS, Chloride and Fluoride

SLEMA has been concerned about the uptrend of Total Dissolved Solids (TDS), Chloride and Calcium. Results from SLEMA modeling predicted that the current Water Licence limit for TDS (350 mg/L) would be exceeded within the mine life (see SLEMA letter dated September 2, 2010). Modeling results from Golder Associate Limited (Golder), confirmed SLEMA's predictions.

In the Reasons for the Decision of the current Water Licence MV2001L1-0002, The MVLWB did not support the use of the British Columbia (BC) Water Quality Objective (WQO), of 150 mg/L for Chloride in surface water for Snap Lake. The reason is that "*Chloride is a constituent of TDS levels in the mine effluent (and may increase to a maximum of 137 mg/L in Snap Lake) but limiting TDS to less than 350 mg/L in Snap Lake should have achieved the same result as a water quality limit for Chloride*". However, modeling work by both SLEMA and Golder predicted that the Chloride level will exceed 150 mg/L (BC guideline), and the exceedance will be earlier than the exceedance of 350 mg/L for TDS (Water Licence limit). As a result, not adopting BC guideline for Chloride may not be justified.

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Fluoride was reported to have exceeded water quality guidelines of the Canadian Council of Ministers of the Environment (CCME) for aquatic life in Snap Lake, based on Aquatic Effects Monitoring Program (AEMP) data. Modeling work by Golder indicated that the exceedance will continue through to 2016. SELMA expressed its concern in a letter dated July 29, 2010.

SLEMA recommends that the MVLWB add both Chloride and Fluoride into the list of WQOs to be developed, and consider the BC guidelines for Chloride and CCME guideline for Fluoride during the development.

- Whole Lake Average Approach to the Protection of Aquatic Life

Part F, Item 11 of current Water Licence (MV2001L2-0002) requires the calculated whole lake average of TDS at SNP 02-18 to remain below 350 mg/L at all time. Based on the above discussion about TDS exceedance, the whole lake average approach may not be adequate for the protection of aquatic life in Snap Lake, especially for the aquatic community in the near field area close to the diffuser.

It would be advisable to have some arrangement to provide an early warning signal and certain level of protection for the aquatic community around the diffuser. SLEMA recommends adding SNP 02-20 into the list of compliance points.

Current Surveillance Network Program (SNP) defines SNP 02-20 as

- "*Snap Lake on the edge of the mixing zone around the diffuser (three stations located in a radius of 120 degrees at 200 meters from the diffuser*".

SNP 02-20 represents a "hot area" directly impacted by the treated effluent from the mine, and would serve as an early warning for the protection of the aquatic community around the diffuser.

Predictions from the comprehensive modeling work and initial toxicity studies by De Beers could help build up the WQO at SNP 02-20.

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2. Surveillance Network Program

- SNP 02-03

The following quotation about SNP 02-03 near the Water Management Pond (WMP) is from the Summary of August 2010 Geotechnical and Geochemical Site Inspection, Snap Lake Mine, which was prepared by Golder, for De Beers.

> *"The water license requires monitoring of site runoff reporting to the WMP at SNP 02-03. SNP 02-03 was formerly located on the eastern perimeter of the WMP. In 2009, temporary kimberlite ore stockpiles placed on the northeastern perimeter of the WMP covered the former location of SNP 02-03. No suitable locations were identified for the relocation of SNP 02-03 during the September 2009 site inspection, owing to the proximity of the kimberlite stockpile relative to the WMP. Given the inability of this station to monitor site runoff the MVLWB approved De Beers' request to permanently suspend the Station on December 3, 2009 (De Beers 2010).*
>
> *Since December 2009, the kimberlite ore stockpiles located on the northeastern perimeter of the WMP have been removed. During the WMP inspection, a potential location for monitoring site runoff to the WMP was identified on the east side of the WMP (12V 0506477 7052531). Water quality samples should be collected from this location, if possible, through 2011 to determine if the composition of the water at this location is representative of site runoff. Such data provides valuable information about the geochemical stability / rate of weathering of the rock used for construction at the site."*

SLEMA provided comments on De Beers' request on November 5, 2009 stating that

- The setup of SNP 02-03 is meaningful.
- Temporary termination of SNP 02-03 is acceptable. The monitoring station has to be re-established after the ore is processed.
- Permanent termination of the monitoring station can be considered during Water Licence renewal.

Because Golder identified a potential location for SNP 02-03 and recommended water sampling in the monitoring station, the station should resume. SLEMA recommends reactivating SNP 02-03 in the new Water Licence.

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- SNP 02-17

Environmental Assessment Report (EAR) predicted a reduction of bottom Dissolved Oxygen (DO) concentrations around the diffuser during ice-covered conditions. However, increases, and not reductions in bottom DO concentrations have been observed in recent years (Snap Lake Dissolved Oxygen Annual Reports). Based on the assessment in AEMP 2010 Annual Report, the increases may result from the release of oxygenated effluent from the diffuser near the lake bottom.

Currently there is no measurement of DO in the treated effluent at the station SNP 02-17. In order to confirm the above assumption of oxygenated treated effluent, SLEMA recommends adding DO into the measurement list of SNP 02-17 in the new Water Lincence.

- SNP 02-18

SNP 02-18 is defined as "*whole lake Total Dissolved Solids, Calcium, Chloride (several sites with the main lake basin of Snap Lake)*", these several sites are not specified. It is also not clear in the current Water Licence how to calculate the whole lake average of TDS.

SLEMA recommends a clear definition of SNP 02-18 and clarification of the calculation of whole lake average of TDS at SNP 02-18 in the new Water Licence.

3. Aquatic Effects Monitoring Program (AEMP)

De Beers' Environmental Assessment predicted that changes to the aquatic community of Snap Lake would be of low magnitude. The Mackenzie Valley Environmental Impact Review Board (MVEIRB) in 2003 defined the low magnitude as

> ➢ "*Low if the water quality change would affect less than 10% of the aquatic community or would affect more than 10% of the aquatic community in less than 10% of Snap Lake*".

However, no related assessment has been undertaken in the AEMP annual reports.

SLEMA recommends that the MVLWB require that De Beers assess the changes to the aquatic community of Snap Lake based on the MVEIRB criteria in the AEMP annual reports.

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4. The North Pile

- Breach Risk in the East Cell

SLEMA remains concerned about the risk of processed water spilling from the East Cell into Snap Lake. On November 26, 2009, SLEMA issued a letter and expressed this concern.

In SLEMA's opinion, the record of past spills in the Starter Cell (see table below) justifies augmented risk assessment and management.

Spills within the Footprint of the North Pile (Starter Cell)

Spill #	Date	Spill Amount	Location	Cause
2006-291	Jul. 22	200 m^3, surface water	Near Temporary Sump #1 (TS1)	Ruptured discharge pipe due to increased pressure
2006-300	Aug. 1	200 m^3, water	Near TS1	Ruptured discharge pipe
2007-217	May 21	10 m^3, surface runoff	Near TS2	Punch lock fitting detached from the hose
2009-005	Jan. 6	20 m^3, process water	TS3	Water level within the sump rose to beyond the designed capacity , water draining through the roadway to the tundra
2009-479	Oct. 19	438 m^3, process water	Near Permanent Sump #2	Frozen pipeline, water seeping under the road to East Cell footprint
2010-458	Dec. 10	110 m^3, process water	TS4	Water pushed out through the Starter Cell berm entering TS4 and into the diversion ditch across the access road along with the north side of TS4

The East Cell is very close to the lakeshore. If any of the above spills occurred in the East Cell, seepage with high levels of ammonia, nitrate and other contaminants could enter into Snap Lake. SLEMA recommends more stringent requirements for the North Pile operation, especially monitoring of water level in the sumps and collection ditch, and water pumping from the sumps to the WMP, in the new Water Licence.

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- Slurry Deposition in the Starter Cell

The North Pile was originally designed on the basis of processed kimberlite (PK) paste deposition. The slurry deposition into the Starter Cell of the North Pile since operation has deviated from the original design and operation schedule.

The Starter Cell contains a large amount of water that was not anticipated. SLEMA recommends that a special study or risk assessment be included as a requirment in the new Water Licence.

5. Site Reclamation

De Beers was required by the Inspector to complete the cleanup of the Ammonia Nitrate Storage Pad (AN Pad) by August 31, 2011, but De Beers could not complete the work by the required date. De Beers was further directed by the Inspector to complete the cleanup by October 14, 2011. SLEMA recommends that the MVLWB require De Beers take confirmatory soil samples to demonstrate the success of the cleanup of the AN Pad, and that the MVLWB consider a term or condition in the new Water Licence, regarding confirmatory soil sampling for any sites at the mine following reclamation.

6. Term of the New Water Licence

The current Water Licence will expire on April 2012. De Beers is requesting a 15 year term for the new Water Licence. SLEMA does not support this length of term. Rationale for a short term duration Water Licence are as follows:

The Fluoride levels will remain higher than CCME guideline till 2016 and the Chloride levels will be above BC guideline in 2016. TDS levels will exceed current Water Licence limit in 2018. These predictions make it inappropriate to grant De Beers a new Water Licence with the term of longer than 6 years.

Compliance performance of De Beers, with regards to the current Water Licence, presented by the Inspector on September 16, 2011 revealed that De Beers needs to improve the environmental management, operation and reporting. This also warrants a shorter term for the new Water Licence.

SLEMA recommends a term of 5 years for the new Water Licence.

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7. Other Recommendations

SLEMA also recommends the new Water Licence contain these requirements.

- The MVLWB recommends a special study of the recently replaced diffuser for the purpose of assessing the performance of the outfall diffuser and the distribution of the diffuser plume in Snap Lake.
- The MVLWB require the submission of electronic raw data for Water Licence Annual Reports and AEMP Annual Reports in Microsoft Excel format. The data submission should also be concurrent with the submission of the reports.
- The MVLWB retain the term or condition about incorporation of Traditional Knowledge into the environmental management.

The Snap Lake Diamond Mine Water Licence renewal process provides the MVLWB an opportunity to improve the existing water licence. The challenge for the MVLWB, in SLEMA's opinion, is determining when an impact to Snap Lake is significant. The environmental assessment predicted impacts to Snap Lake and provided mitigation for these impacts to prevent them from becoming significant. For example, is whole lake TDS average sufficient to judge the significance of impacts to Snap Lake?

There is also concern about the management systems in place at the mine site, particularly as they pertain to addressing identified and emerging issues such as Ammonium Nitrate/Fuel Oil (ANFO) management and fixing of a malfunctioning diffuser. In both cases, the time between problem identification and any action being taken was excessive, and even then, actions seem only to happen when issues become serious. It is SLEMA's opinion that current management practices are reactive; not proactive. This creates unnecessary environmental risk.

SLEMA encourages the MVLWB to have De Beers demonstrate that it is using the data derived from its Water Licence monitoring to undertake integrated mine site water management, linking mine site practices to environmental outcomes. The new Water Licence should require De Beers to demonstrate it has synthesized the monitoring data to create relevant knowledge to facilitate proactive management decisions and practices.

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If you have any questions whatsoever please feel free to contact the undersigned or David White at 867-765-0961 / dwhite@slema.ca.

Sincerely,

(Original signed by)

Johnny Weyallon
Chairperson

cc: Aboriginal Affairs and Northern Development Canada
Fisheries and Oceans Canada
Environmental Canada
Environment and Natural Resources, GNWT
De Beers Canada Inc.