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Lisa 28Jan03

**EA-SnapLake**

10:06am

**From:** Ramsey, John [jramsey@NRCan.gc.ca]  
**Sent:** Tuesday, January 28, 2003 9:46 AM  
**To:** EA-SnapLake  
**Cc:** Burgess, Margo; Hogan, Charlene; Clausen, Scott; Kasemets, Juri; Tupper, Rennie  
**Subject:** FW: EA - Snap Lake - Revisions to Day 7 and Day 8 Technical Session Summary notes



ss rev Day seven - Geotechnica...    ss revDay eight - Geotechnical...

Hi Glenda,

Attached please find NRCan's revisions (in red and red strike-out) to the Day 7 and Day 8 Technical Sessions Summary Notes.

If you have any questions, please contact me.

Thank you.

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> AR and Air Quality2.doc>>  
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## Review of Agreements/Disagreements - Resolved/Unresolved Concerns/Issues and Commitments Made at the MVEIRB Technical Sessions for DeBeers Snap Lake Diamond Project

### Geotechnical

<b>Legend:</b>	
<b>Commitments:</b>	<b>in bold</b>
<u>Disagreements:</u>	<u>underlined</u>
<i>Likely Resolved:</i>	<i>italicized</i>
Not resolved:	shaded
Questionable Resolution:	outlined

#### *Day Seven – Morning Session*

LDFN Elder Comment: We are concerned about potential for contamination to Snap Lake because it is close to our community. We have raised concerns with De Beers in the past when they have visited our community. Water is especially important to keep clean because all living things need and use it. We are concerned about the reduced amount of caribou migrating around our community, since the diamond mines have been developed in the north – all of the mining companies are in the path of the caribou migration. Caribou eat the mud from the tailings ponds. We have noticed some injured (limping) unhealthy caribou – they may be sick from eating mud from the tailings ponds. We assumed the technical sessions would be the best place to bring up these issues.

<b>DIAND Concern:</b>	<b>De Beers Response:</b>
<ul style="list-style-type: none"> <li>▪ We have a concern with the potential for additional water through elevated moisture content of the paste backfill causing an increase in water being delivered to the north pile. There are a number of factors that may cause the temptation to increase the water content of the paste backfill. For example: 1) The paste will be abrasive and cause wear and tear on pipes and pumps; and 2) The pumping pressure/energy requirement to dewater the tailings</li> </ul>	<ul style="list-style-type: none"> <li>▪ Please present a specific question.</li> </ul>

DIAND Concern:
<ul style="list-style-type: none"> <li>There is not a concern with stability. The concern is with pore water management. If pore water is released from the pile to the lake after freezing in the pile, the pore water may have elevated concentrations of dissolved materials. We have insufficient information at this time to determine how high concentrations will be. Initially, I thought this was not an issue because I thought the pile would be frozen. But I am not convinced the pile will be completely frozen and I am now concerned about the release of fluids into the local area close to the pile near the lake. I agree that if we take total volume of the lake and add material from the pile, an argument could be made that the impact would be small. But if the repeated discharge from the pile is in a small part of the lake, the impact on that bit of lake could be greater than the impact on the whole lake. I don't think the model is inappropriate - just that boundary conditions of the model (as summarized above) don't have all of the information that would allow me to resolve this in my mind and I consider this an unresolved issue at this point.</li> </ul>
De Beers Response:
<ul style="list-style-type: none"> <li>We would like to think about it and get back to you.</li> </ul>
Not Resolved – to be resolved.

MVEIRB Comment: Tailings tend to be wetter than what De Beers is expecting and rates of freezing are slower than expected from modeling. The calibration in the top 10 m appears to be off in comparison to measured ground temperatures in all four seasons (related to freezing rates). Concerns are shared with DIAND with respect to the thermal model and freeze-back timeframes (may be longer than timeframe estimated by De Beers). It is very positive that you are starting out with a strong containment section. Based on monitoring and instrumentation, there is much to learn about the rate of freeze-back and seepage and pore pressures associated with that (which is valuable information for De Beers). In summary there is not so much of an issue but support for DIAND's concerns on the accuracy of the thermal model and rate of freeze-back.

NRCan Concern:	De Beers Response:
<ul style="list-style-type: none"> <li>When I compare modeled air temperatures for the Snap Lake area, the simulated air temperature data is much colder than what is recorded at Snap Lake. There is up to a 5-6 degree difference in the winter months. Are you using air temperature data that are <u>relevant relative and that reflect current conditions?</u> <u>The use of inappropriate climate data could be another source of error in addition to those mentioned by DIAND and may be part of the reason the</u></li> </ul>	<ul style="list-style-type: none"> <li>There is a long history of air temperature measurements in Yellowknife and Lupin and only a couple of years at Snap Lake. Our focus was to ensure the stability of the structure should temperatures continue to rise causing the pile not to freeze solid. Thermal modelling was done to understand how to operate the pile (frozen and unfrozen layers etc.). We started to look at what mitigation measures were needed to build into the system to handle those things.</li> </ul>

<p><u>simulated ground temperatures and active layer thickness are less than observed values. If you are off on the air temperature data that you are using to drive the model is invalid - the errors are compounded throughout the simulation and there will be errors in the final results. it throws off a lot of other factors.</u></p> <p>Are you taking into account that the climate may change and that there may be warmer temperatures during the life of the project?</p> <ul style="list-style-type: none"> <li>With respect to the ponds in the north pile - have you considered the effects of the removal of organic matter <u>such as warming and increases in active layer thickness</u> (seepage/ground warming beneath the pile etc.)?</li> </ul>	<ul style="list-style-type: none"> <li>Yes. Concerns with increased active layer, massive ground ice relating to the stability of the pile were addressed. We addressed this within the seepage model of the EA. There should be a small impact on the pile itself. We are also already looking at the thawed layer for bypass water.</li> </ul>
<p>Not Resolved – thermal modelling concerns on a whole are unresolved. Discussion tomorrow will continue regarding the climate data model and organic materials with respect to the permafrost regime.</p>	

<b>DIAND Concern:</b>	<b>De Beers Response:</b>
<ul style="list-style-type: none"> <li>Acid rock drainage issues with respect to potential contingencies should kimberlite not react as predicted. Kimberlite predictions for EKATI were proven to be inaccurate. In light of the difficulty of kimberlite predictions it would be prudent to determine what contingency measures are available if the kimberlite should prove not to be predictable. Could this be undertaken? Please comment.</li> <li>Not proposing – but should kimberlite produce a lower pH as with EKATI, is there potential for De Beers to provide a contingency plan should it happen at Snap Lake?</li> </ul>	<ul style="list-style-type: none"> <li>What are you proposing?</li> <li>As indicated in the EA, De Beers already committed to operate the water treatment (and monitoring) until the water meets acceptable criteria. Your point is well taken that we need to ensure that we have thought through a contingency for it. At this stage, we have not</li> </ul>

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**Geotechnical, A&R and Air Quality**

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**Day Eight – Morning Session**

A “break out session” was held on the 3<sup>rd</sup> floor of the Scotia Centre in the De Beers office to attempt to further resolve issues. See Appendix D North Pile (Geotechnical) Breakout Session, Day 7 Evening, December 3, 2002.

<b>NRCan Concern:</b>	<b>De Beers Response:</b>
<ul style="list-style-type: none"> <li>▪ Why wasn't any ground penetrating radar work done to look for massive ice in eskers given that in the same types of sediments at BHP and DIAVIK – <del>masses of ice were</del> <u>massive ice was found</u>? Implications relate to the impacts of disturbing ground ice.</li> <li>▪ <u>There are ponds that have been attributed to melting of massive ice in the esker so it is likely that there are massive ice masses/bodies</u> out there. It will also need to be considered with respect to reclamation.</li> <li>▪ It seems assumptions have been made on how thick permafrost is and on the size of taliks under the lakes. The distribution of taliks <u>and</u> <del>in</del> permafrost has <u>an</u> affects on the</li> </ul>	<ul style="list-style-type: none"> <li>▪ The area affected has been small in the past. Prior to any future work being done it would be prudent to commit to do a ground penetrating radar survey. <b>We will commit to do that work before any future work is done on an esker site.</b></li> <li>▪ Regional 2D modeling on the thermal regime has not been done. Some thermisters have been installed on the north lake and near Snap Lake. There is some understanding of the permafrost thickness under and near the lakes. The concern is the influence of all the lakes together with their taliks.</li> </ul>

<p>groundwater regime as well. <u>There are numerous lakes in this region and their influence together on the ground thermal regime and distribution of permafrost and taliks has not been determined.</u> Is there no intention to do 2D thermal modeling and determine the thickness of permafrost and how taliks may be distributed under the lakes?</p> <ul style="list-style-type: none"> <li>How certain are you that those taliks you <del>decide</del> <u>have determined</u> are there are the only connection between the lakes and the groundwater? The implications are on the movement of groundwater from the mine workings and so forth.</li> </ul>	<p>We have lots of lakes and not just one lake that determine the talik size – it’s the impacts of all lakes together. This has an affect on the environment as an impact for groundwater modeling. These last 2 sentence appear to be NRCan’s comments.</p> <ul style="list-style-type: none"> <li>We feel we have enough data and have made the correct decision. It is now up to others to recommend to the board that data is inadequate for whatever reason.</li> </ul>
<p><i>Likely Resolved – for the moment NRCan is considering DeBeers response before determining if issue resolved</i></p>	

DIAND Comment: Configurations of taliks could be estimated from information provided even though they have not been delineated.

<b>NRCan Concern:</b>	<b>De Beers Response:</b>
<ul style="list-style-type: none"> <li>De Beers is claiming that the water management pond containment does not depend on frozen conditions. On the other hand, there is a talik that the dam sits on at the south end of the water management pond and the extent of the talik (vertically and laterally) is unclear. If there is climate-warming seepage could occur in the ground beneath the dam.</li> <li>Is there any thawing around the water management pond itself or seepage from it due to thawing of</li> </ul>	<ul style="list-style-type: none"> <li>I can’t recall the thickness of the talik offhand – it is approximately 13m. For two years there has not been any changes in thermal conditions in the area of the dam (the conditions are fairly stable). The design is reliant on bedrock. Some seepage will occur as warming of the bedrock occurs. That has been incorporated into the water quality model and used in the EA. We are not relying on the frozen condition.</li> <li>To my knowledge, there have been no observations of seepage. However, it is inappropriate to</li> </ul>

underlying material?	comment until we have re-consulted the report on the performance of the dam to date.
<i>Likely Resolved – for the moment. NRCan is considering DeBeers response before determining if issue resolved</i>	

<b>MVEIRB Concern:</b>	<b>De Beers Response:</b>
<ul style="list-style-type: none"> <li>▪ Is the talik of the water management pond and Snap Lake overlapping?</li> <li>▪ Based on modeling, will the two ever connect?</li> </ul>	<ul style="list-style-type: none"> <li>▪ The talik of the water management pond does not connect to the deep talik of Snap Lake. There is only a shallow connection.</li> <li>▪ The dams will be raised and the pond will be maintained as low as possible for future storage requirements. We would not expect taliks to develop significantly beyond what it is now.</li> </ul>
Questionably Resolved???	

<b>DFO Concern:</b>	<b>De Beers Response:</b>
<ul style="list-style-type: none"> <li>▪ Is there a distance away from large lakes (i.e. Snap Lake) where taliks are non-existent? And how does it relate in terms of the water management.</li> </ul>	<ul style="list-style-type: none"> <li>▪ The distance is specific for each lake for how far the talik extends under the shoreline. In the water management pond we know there is one talik that extends towards Snap Lake and we have accounted for this in the water quality model. The taliks are not deep enough to link up with the flow of ground water.</li> </ul>
Questionably Resolved???	

DIAND Comment: The depth and configuration of unfrozen ground beneath the lake depends of four variables – all are charted within this study (temperature of permafrost surrounding the lake, geothermal gradient, temperature at the bottom of the lake, and width of the lake). With the four variables we can estimate the thickness and shape of the taliks. We can also determine whether they are through taliks (connect with unfrozen ground at depth) or if they are confined by permafrost. For lakes of similar size in other Canadian regions calculations indicate that the taliks beneath lakes are confined and don't connect with permafrost at depth. The calculation is very straightforward and I can provide a reference.

<b>YDFN Concern:</b>	<b>DIAND Response:</b>
<ul style="list-style-type: none"> <li>▪ Specifically lakes n15 and n16 are not wide enough to have a talik to connect with deep ground water (lakes about 50m wide)? Does that</li> </ul>	<ul style="list-style-type: none"> <li>▪ Characteristically the width of the lake is the most variable condition. Temperature at the bottom of the lake does not vary much on an</li> </ul>

<p>seem valid?</p>	<p>annual basis. Width tends to be the key for lakes of that size and where permafrost thickness is about 200m, - in general they are not through taliks. Be clear that the specific calculations have not been done for the lakes.</p>
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<p><b>NRCan Concern:</b></p>	<p><b>De Beers Response:</b></p>
<ul style="list-style-type: none"> <li>▪ With respect to the impact of mine infrastructure... there is some organic material around the airstrip construction area. Will you be putting fill on top of the organic material?</li> <li>▪ This is one area where may have high ice content – are you prepared to deal with <u>sediment that may build-up</u> <u>thaw settlement that may occur</u> there?</li> <li>▪ I understand that <u>thawing of permafrost surrounding the ramp and ventilation raises will not result in <del>protects against</del></u> structural impacts but have you considered thermal warming impacts with respect to seepage and possible increase of seepage (causing water flow enhancement)?</li> <li>▪ With respect to the operation window of the winter road – over the next few years the traffic will be the heaviest. De Beers has calculated how many days the road will be open. <u>A linear warming trend has been considered in the analysis. Examination of the air temperature data however indicates that the rate of warming has been greater since the 1970s. Have you taken this more recent climate-warming data into account?</u></li> <li>▪ Snowfall early in the season can be important – did you look at the probability of this occurring?</li> </ul>	<ul style="list-style-type: none"> <li>▪ At this stage, we are proposing to spread a fill across the area.</li> <li>▪ Yes it will be an ongoing maintenance issue until it stabilizes.</li> <li>▪ We addressed this last week during the water quality sessions. There is limited recharge in the area and the potential amount of seepage will be small when compared with that of the mine.</li> <li>▪ We require that the winter road be open past 2010 and then until the end of the mine life for resupply of consumables. We have a presentation to give on the winter road in terms of analyzing weather and ice data and the capacity of the winter road.</li> <li>▪ Yes, we tried, but snow depth data was too scattered.</li> </ul>