



Date 01 November 2002

Company Name Mackenzie Valley Environmental Impact Review Board
Address Box 938, 5102 – 50th Street
Yellowknife, NT
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Attention: Louie Azzolini, Environmental Assessment Officer

Dear Louie:

SUBJECT: Submission of De Beers' Technical Information Sessions (17-19 April 2002) and North Lakes Technical Information Session (9 October 2002) Meeting Notes

Attached please find a copy of the meeting notes from each of the following technical sessions held by De Beers Canada Mining, for release on the public registry. Topics included are:

- Project Overview
- Accidents & Malfunctions
- Air & Noise
- Aquatic Resources
- Archaeology
- Cumulative Effects
- Environmental Assessment Approach
- Economics
- ELC & Biodiversity
- Environmental Health
- Terrestrial Geology & Terrain
- Socio-economic Impact Assessment
- Surface & Groundwater Hydrology
- Traditional & Non-traditional Land Use
- Wildlife
- North Lakes Program

With the exception of the 9 October 2002 session on the North Lakes Program, all technical sessions were held from 17-19 April 2002.

Additionally, a response addressing a question raised by Environment Canada as a result of the North Lakes technical session is attached.



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481

DE BEERS
A DIAMOND IS FOREVER

Should you have any questions on this information, please feel free to contact the undersigned at (867) 766-7322.

Sincerely,
SNAP LAKE DIAMOND PROJECT



Robin Johnstone
Senior Environmental Manager

cc: Please see attached distribution list

De Beers Canada Mining Inc.
Snap Lake Diamond Project
Environmental Assessment – Technical Information Session
April 17-19, 2002

**Summary of Questions and Answers
Day 1**

De Beers Canada Mining Inc. hosted a technical review session April 17-19 at the Capitol Theatre in Yellowknife. The purpose of the session was to allow an informal discussion on the technical details of the Snap Lake Diamond Project. De Beers employees and consultants made presentations to introduce the approach the company has taken to the Environmental Assessment and to explain the analysis presented in each chapter of the EA report. The sessions were attended by representatives of the federal and territorial governments, regulatory bodies, First Nations and by members of the general public.

This summary lists the presentations made (presentations are filed separately), followed by the questions raised by the audience. In some cases questions required a more detailed answer than could be provided on the spot, therefore De Beers committed to responding to the question in writing and to placing the written response on the public record.

For ease of reading, this document is not a verbatim transcript of the session. Instead, a summary of questions and answers is presented, using as closely as possible the words of the participants. In some cases, the questions and answers are paraphrased, particularly when several people contributed to the answer.

Day 1 – Presentation: Project Overview (John McConnell)

Questions:

- (Chris Paci – Dene Nation): How would you characterize the relationship between De Beers and First Nations living near De Beers' projects in Ontario and Saskatchewan? Would you say it is a good relationship?
 - John McConnell: So far, we have had an open dialogue. You might hear different views, depending on whom you talk to, but we feel it is a good relationship. We hope to continue having a fruitful dialogue in the future. Many of the employees at these projects are Aboriginal.

Presentation: Project Description (Greg Oryall)

Questions:

- (Craig (no last name provided)-- INAC): What is the amount of exhaust from the mine and does it exit via the portal? Will the exhaust be monitored as part of the air quality monitoring program at the mine?
 - Greg Oryall: Exhaust will exit via the two vent raises that are to be built on a peninsula north of the mine site. Modelling has been done to predict the amount of exhaust as part of the overall air quality program. It should be noted that there will be no permanent road to the vent raises. Helicopters will be used if the vent raises need to be serviced during the summer months.
- (Bob Turner -- North Slave Metis Alliance): Do you have a picture of the site before any construction happened?
 - De Beers will supply a photograph of the site prior to any construction taking place.

De Beers Canada Mining Inc.
Snap Lake Diamond Project
Environmental Assessment – Technical Information Session
April 17-19, 2002

Summary of Questions and Answers
Day 1

Presentation: Corporate Approach to Environmental Assessment (Robin Johnstone and Bette Beswick)

Questions:

- (Jane McMullen -- RWED): in calculating the magnitude of impacts, are you using absolute or relative values?
 - Magnitude is based on a percentage of the original measurement, in most cases.
- (Steve Wilbur – Dogrib Treaty 11): Has this EA approach been used for other projects?
 - Bette Beswick: it is similar to the approach used for some projects in the Alberta Oil Sands and similar to the Diavik project in the NWT. However, all projects differ somewhat, so no EA is identical to another.
- (Follow-up questions): Are you confident that values can be assessed accurately? What if a measurement is “off the scale”?
 - There is no absolute right way to do an assessment, but we are confident that this approach provides for accurate measurements. Scoring is relative. What’s important to look at is how we have partitioned items and how we have applied scoring criteria.
- (Jane McMullen -- RWED): Does the 100-year scale for reversibility apply to all sections of the EA report, including measurements of social impacts?
 - That scale does not apply to the social impacts part of the EA report.
- (Craig X -- INAC): Will seepage from the laydown areas be treated?
 - Greg Oryall: the laydown areas are intended for offloading materials, such as construction supplies. The areas will have ditches around them, but it is not anticipated that any materials that would cause concern would be placed in these areas.
- (Ray Case – RWED): Will the monitoring program test predictions that are uncertain at the time of the EA report?
 - Robin Johnstone: the monitoring program is designed to find answers to uncertainties.
- (Steve Wilbur – Dogrib Treaty 11): do the impacts listed include the closure period?
 - Bette Beswick: yes.
- (Tim Byers -- Yellowknives Dene): The present Processed Kimberlite pond is going to become the Water Management Pond as the project develops; what will happen to the processed kimberlite that’s in the pond now?
 - Greg Oryall: it will be transferred to the North Pile at an appropriate time. Periodically, during the life of the mine, the Water Management Pond will be cleaned out and material transferred to the North Pile.
- (Bob Turner -- North Slave Metis Alliance): Following reclamation of the mine site, will it be possible to land on the airstrip, thereby created new access to the area?
 - Greg Oryall: In the past, it was a general practice to leave airstrips in place, in case they were ever needed for an emergency landing. However, airstrips degrade over time and become unsafe for landing, so they are not in fact much help during an emergency. Our intention is to decommission the airstrip and advise pilots that it is unsafe for landing.

De Beers Canada Mining Inc.
Snap Lake Diamond Project
Environmental Assessment – Technical Information Session
April 17-19, 2002

Summary of Questions and Answers
Day 1

Presentation: Socio-economic Assessment (Peter Homenuck)

Questions:

- (Chris Paci – Dene Nation): why does the Snap Lake EA draw comparisons with the Diavik and BHP projects but not with De Beers' experience in southern Africa?
 - Peter Homenuck: we feel it's important not to take the results of studies done in one place and impose them on different countries and cultures. Our view is that the North is unique and should be addressed using information gathered in the North. A comparison of experiences in different cultures is interesting, but we must focus on the local situation.
 - John McConnell: the company's experience in southern Africa informs the decisions made in the Snap Lake EA, but the situation here is different from Africa.
 - Offer made to discuss this issue during the break (see separate notes)
- (Steve Wilbur – Dogrib Treaty 11): is there a different strategy to handle socio-economic impacts from the Snap Lake project compared to southern Africa?
 - John McConnell: the same basic principles are applied, but the impacts are of a different order of magnitude. The social problems in southern Africa are far greater than those in the NWT. We feel the best thing we can do is provide education and employment.
- (Jane McMullen – RWED): mines provide some well-paying jobs that young people can do straight out of high school, so there is less incentive for them to undergo further training. Have you considered the effect of this and of a "brain drain" on communities?
 - Peter Homenuck: People have told us that skilled workers tend to leave the smaller communities because there is no work for them there. We feel that by encouraging economic development in these communities we can help to slow or reverse this trend.

Presentation: Traditional and Non-Traditional Land Use (Bette Beswick)

Questions:

- (Steve Wilbur – Dogrib Treaty 11): why is the Regional Study Area 31 Kilometres around the mine? How did you choose that number?
 - Robin Johnstone: when we started collecting baseline data, we needed to choose an area that could be measured intensively. We designed the RSA to include the esker road, the ice road to the site, the quarry and major esker system. These features are all above the tree line, so we wanted to have an area that was entirely made up of that ecoregion. We have taken into consideration sites that are near but still outside the RSA.
- Follow-up question: did you consider taking a corridor approach to the RSA, for example, the area around a road?
 - Robin Johnstone: the difficulty with that approach is that the present-day transportation corridors are not necessarily the same as traditional routes, which were based around land forms, rather than a constructed road.

De Beers Canada Mining Inc.
Snap Lake Diamond Project
Environmental Assessment – Technical Information Session
April 17-19, 2002

Summary of Questions and Answers
Day 1

- 2nd follow-up question: has access to traditional areas via the road been addressed in the EA?
 - Bette Beswick: yes it has.
- (Jane McMullen – RWED): have you sought comment from the owners of lodges in the area?
 - Robin Johnstone/Bette Beswick: we have not talked to all of them, but we have talked to MacKay Lake Lodge about the possible effects on fisheries. We have considered noise in the EA and note that the lodges are closed during the time when the winter road is open. They will hear distant sound of aircraft periodically during the summer months. We have also considered the effects of noise on camps in the area.

Presentation: Archaeology (Jean Bussey)

Questions:

- (Jane McMullen – RWED): Did you date the archaeological finds?
 - Jean Bussey: most finds were unworked flakes left over from the creation of stone tools. These flakes can't be dated. There are stone tools that can be dated, but none of these was found in the Snap Lake area.
- Follow-up question: You researched the area around the proposed gravel pit. Can you talk about the buffer zone around any archaeological finds in the gravel pit area and about what will happen if further pits are needed?
 - Jean Bussey: Legislation requires a 30-metre buffer zone around archaeological finds. I always recommend a larger buffer than that. I researched a much larger area than is required for the gravel pit. There is room to expand the pit, but De Beers will refer to an archaeologist before proceeding.
- (Steve Wilbur – Dogrib Treaty 11): What do you mean by "walking" an area? How long does it take to walk an area and how many people are involved?
 - Jean Bussey: an assistant and myself walked one small area. Larger areas were checked by myself and a group that included Yellowknives Dene and Lutsel K'e Dene First Nations representatives. The length of time taken depends on the size of the area and the number of finds. It takes a couple of hours to document each find.
- Follow-up question: how can you be sure you've found everything?
 - You can never be 100 per cent sure, but the chances of finding everything are very good in this area because it is above the tree line and the land is very exposed. There's also a lot of bedrock – it was quite difficult to find 5-10 centimetres of soil to conduct shovel tests. (Shovel tests are done to see if there could be objects buried in the soil). I have no doubt there are other sites in the general area, but they were not found in searching around planned development.
- Second follow-up: Will staff be allowed off the main mine area?
 - John McConnell: We have always asked people to limit their use of the land to the roadways and the airstrip and will continue to do so. We would like to have a walking trail system so that employees can get out for some fresh air and exercise, but we will conduct archaeological surveys before doing that. We also plan surveys in the area proposed for the vent raises that will ventilate the mine.

De Beers Canada Mining Inc.
Snap Lake Diamond Project
Environmental Assessment – Technical Information Session
April 17-19, 2002

Summary of Questions and Answers
Day 1

- (Tim Byers – Yellowknives Dene): You have a no fishing policy at the site now. Did that exist during the exploration period?
 - John McConnell: that policy has been in place since at least as far back as 1999. However, I wouldn't be surprised if there was some fishing done back in the earliest days of exploration.

Open Question Period – end of Day One

- (Jane McMullen – RWED): What do you think are the biggest lessons that you've learned from BHP and Diavik's experience?
 - Robin Johnstone/Peter Homenuck: There are a number of ways we've benefited from the earlier projects. We have the benefit of information that has been gathered in the past; we are aware of issues that have been raised with the other projects; we've learned it's important to talk to communities early on; we've learned that a broad range of input is needed from communities and from the different levels of government, and that partnerships are necessary to deal with issues.

De Beers Canada Mining Inc.
Snap Lake Diamond Project
Environmental Assessment – Technical Information Session
April 17-19, 2002

Summary of Questions and Answers
Day 2

Open Question Period – questions arising from the previous day's presentations.

- (Steve Wilbur – Dogrib Treaty 11): How is the ISO 14001 environmental management standard different from Canadian standards?
 - Robin Johnstone: ISO 14001 is an international standard for environmental management that has been used successfully throughout the world. It requires transparency in our operations and high environmental performance. It commits us to continual improvement in environmental management and performance. It is not a replacement for Canadian legislation.
 - (Commitment to provide written information about ISO 14001. Material was provided before the end of the sessions)
- (Chris Paci -- Dene Nation): why doesn't the EA address the historical experience of indigenous peoples with De Beers' mining operations?
 - Robin Johnstone: We focussed on what the MVEIRB asked us to do. The Terms of Reference required us to discuss our mining operations in Canada and in Arctic regions. To date, we have had no mines in Canada or in the Arctic. The Terms of Reference also asked us to discuss our experience in countries with comparable standards to Canada. Standards are very different between southern Africa and Canada and we did not feel a comparison was possible.

Presentation: Air and Noise (Martin Rawlings)

Questions:

- (Tim Byers – Yellowknives Dene): what is the dust impact around the crusher referred to in the presentation? Isn't all that done underground?
 - John McConnell: The crusher is used aboveground during construction to make gravel for construction needs. The machine will be crushing granite during construction and Kimberlite underground during operations. We have plans to use dust collectors.
- (Jason McNeil – RWED): what are you doing to mitigate greenhouse gases? Notes that figures provided in the EA refer to both NWT and Nunavut.
 - John McConnell: ISO 14001 registration requires us to review our operations and continually improve in this area. As better technology is developed, we will adopt it.
 - Martin Rawlings: undertakes calculate emissions for the NWT only and follow up by letter, which will be placed on the public record.
- (Steve Wilbur – Dogrib Treaty 11): did you consider using propane instead of diesel fuel?
 - John McConnell: we never considered propane for power generation, but we did think about it for heating. The use of propane was rejected because of concerns about transporting it safely to site and availability.
- (Paula Pacholek-- Environment Canada): the modelling in the presentation showed that there was an area where dust exceeded the criteria. What mitigation measures will be used?
 - Martin Rawlings: the model showed one day out of five years of operation when dust would exceed criteria in a very localized area. The area and the length of time the problem would last are both so small that we have not been able to identify measures beyond the ones we already plan to use at the mine.

De Beers Canada Mining Inc.
Snap Lake Diamond Project
Environmental Assessment – Technical Information Session
April 17-19, 2002

Summary of Questions and Answers
Day 2

- (Follow-up question): were you able to model how noise would affect wildlife?
 - Robin Johnstone/Martin Rawlings: we know there are differences in the way animals and humans hear, but we do not have criteria to measure how animals respond to noise. Laboratory studies have been conducted, but there is no reliable way to extrapolate those findings to animal response in the wild.
- (Follow-up question): Wouldn't it be possible to study disruption on animal behaviour due to acute noise?
 - Robin Johnstone: in theory, yes. There has been work done at Ekati, but they are using a different mining method from Snap Lake. We also need a perspective; the noise from Snap Lake will tend to be continual rather than short bursts of loud noise. We can consider monitoring to collect information that currently does not exist. This is part of the EA process; we identify issues and actions that should be addressed.
- (Steve Wilbur – Dogrib Treaty 11): how can you say what the effects of noise on animals will be if there are no standards?
 - Martin Rawlings: the air and noise study assessed the change in noise levels – other consultants considered the effects on the environment and will discuss that in their presentations.
- (Tamara Hamilton – INAC): will you be using water or a chemical dust suppressant?
 - Martin Rawlings/John McConnell: we plan to stagger the North Pile activities to minimize the amount of dust that could be generated by exposed areas. We plan to use only water on the airstrip and roadways, but are willing to test environmentally friendly options if they arise in the future.
- (Steve Wilbur – Dogrib Treaty 11): how was the model created? Are the measurements used representative of the conditions at all times of year?
 - Martin Rawlings: Standard practice is to use one year of on-site readings or five years from the closest station. We used 20 months of on-site readings. These measured every hour during that time period. They reflect a full range of wind conditions, which we believe are representative of the conditions that will exist during the life of the mine.
- Follow-up question: wouldn't there be exceptionally windy years during the life of the mine? How would exceptionally high winds affect dust in the area?
 - Martin Rawlings: we would be more concerned with very low winds, because they would deposit high concentrations of dust over smaller areas. High winds disperse dust over larger areas, but the concentration of dust is diluted.
- (Glenn Groskopf – Environment Canada): wouldn't high winds result in more dust? Did you study emissions during high winds?
 - Martin Rawlings: we studied emissions during a range of wind speeds, but concentrated on high winds. Emissions from the underground mine were unaffected by wind speed. Dust suppression would be used on roads as needed and we calculated for high winds when planning the development of the North Pile so that appropriate mitigation measures could be built in.
- Follow-up question: Would air inversions occur at Snap Lake?
 - Snap Lake is a very unlikely site for an inversion to occur. We did test for dust emissions at various different heights.

De Beers Canada Mining Inc.
Snap Lake Diamond Project
Environmental Assessment – Technical Information Session
April 17-19, 2002

Summary of Questions and Answers
Day 2

Presentation: Environmental Health (Stella Swanson and Cindy Robinson)

Questions:

- (Lori Forster-Clegg -- Environment Canada): Do you have concerns over the results for toddlers' exposure to Naphtha in your model?
 - Stella Swanson/Cindy Robinson: we assumed in the model that the toddler would spend 30 days sitting on the ground right next to the perimeter of the mine. It is a highly unlikely scenario – if we get these types of results in an extreme situation, we are confident that the actual results under normal conditions will be safe. The measurements used in the model are standard ones that are generally accepted.
- (Robert Mulders – RWED): Would exposure to aluminium as shown in the model affect the growth of grizzly bears?
 - Stella Swanson: we don't see that there'd be an effect on growth. There is a high baseline measurement for aluminium and only a slight variation between the baseline and the application measurements. In developing this model, we deliberately overestimated exposure.
- (Steve Wilbur – Dogrib Treaty 11): Why did you use these parameters?
 - Cindy Robinson: we looked at every exposure pathway. The first step was to see if any chemicals would be over the guidelines for human exposure – note that there are no guidelines for plants and none for human exposure to certain chemicals – and where there are no guidelines, we continue to study those chemicals.
- (Sherry Lovely – NWT Dept. Health and Social Services): why aren't teens included in the model?
 - Cindy Robinson: they are included in the "child" category.

Presentation: Geology and Terrain (David Kerr)

Questions:

- (Steve Matthews – RWED): What is the water content of the North Pile?
 - Greg Oryall: answering earlier question about water content of the processed kimberlite in the North Pile. Appendix 3.1 of the EA report shows water as approximately 27 per cent, by weight.
- (Ray Case – RWED): how will organic materials that are removed be stored or used?
 - David Kerr: they would be used for reclamation wherever possible; otherwise, they'd be placed over insulating materials that protect permafrost.
- (Steve Wilbur – Dogrib Treaty 11): how thick is the talik below the lake and what is the range of permafrost? Does the Crown Pillar involve the talik? Do you have ice content mapped?
 - John McConnell: The Crown Pillar is not permanently frozen. Commitment to check the exact temperature of the Crown Pillar.

De Beers Canada Mining Inc.
Snap Lake Diamond Project
Environmental Assessment – Technical Information Session
April 17-19, 2002

Summary of Questions and Answers
Day 2

Presentation: Biodiversity (David Kerr)

Questions:

- (Chris Paci – Dene Nation): How unique is this area?
 - David Kerr: All land is unique in its way, but the area around Snap Lake is typical of the land in the larger region. It is similar to the overall Taiga-Shield area. If we had found situations and plants that occurred only in this area, we'd feel differently, but what we have found seems to be representative of the overall area.
- Follow-up question: What is the schedule for dust suppression?
 - That's determined by need and by daily assessment. Employees at the mine will be responsible for that assessment.
- Follow-up #2: If biodiversity in the Snap Lake area is reduced, what will that do to the overall region?
 - It is generally considered that diverse areas are better able to deal with disturbance. Our study of Snap Lake shows little change to the biodiversity of the area and we believe the area will be able to cope with the disturbance caused by the mine.
- (Lori Forster-Clegg – Environment Canada): What are the effects on rare plants and are any of the rare plants found in the area COSA listed?
 - David Kerr: No rare plants are affected by this project. Rare plants surveys list what rare plants might be found in this area but, in fact, we found no such rare plants that would be affected by the mine. There was one rare fern found in the Regional Study Area.
- (Steve Matthews – RWED): are the ELCs used in this survey the same as for BHP and Diavik?
 - David Kerr: they are consistent with RWED's classification system.
- (Steve Wilbur – Dogrib Treaty 11): how long will it take plants to establish growth on the North Pile?
 - David Kerr: A long time. Surface materials will be placed on the North Pile to encourage plants. We expect that the first plants will appear fairly quickly, but that it will take longer for a full range of plants to develop. We're estimating 5-10 years for grass and much longer for trees and shrubs.
- (Chris Paci – Dene Nation): can you comment on the effects of the vent raises on plants?
 - David Kerr/Martin Rawlings: We have modelled the effects of the main sources of dust. As the vent raises are a much smaller source of dust, we have not conducted modelling specific to them. However, they were included in the overall air quality modelling for the site and will be monitored as part of the overall dust monitoring program at the mine.
 - Monitoring programs tend to check plants for pollution that could be passed onto animals. We're not aware of any monitoring programs that check only the health of the plants themselves.

De Beers Canada Mining Inc.
Snap Lake Diamond Project
Environmental Assessment – Technical Information Session
April 17-19, 2002

**Summary of Questions and Answers
Day 2**

Presentation: Wildlife (Robin Johnstone and John Virgl)

Questions:

- (August Enzoe -- Lutsel K'e Dene First Nation): Are you surveying for caribou right around the footprint of the mine? Would you consider monitoring for Arctic Hare and Ground Squirrel?
 - Robin Johnstone: we have not been surveying on the mine footprint so far, but we are willing to discuss doing that. So far, we have done aerial surveys and recorded any animals seen at the site. I can't commit today to surveys for other animals.
- (Steve Wilbur – Dogrib Treaty 11): question about caribou found dead at BHP site.
 - Robin Johnstone: I can't speak to BHP's situation, but we've recognized that accidents can happen and we are taking steps to avoid them at Snap Lake.
- Follow-up question: Have you considered that caribou might drink from the Water Management Pond?
 - Yes, and we have received advice from Lutsel K'e regarding fencing the pond.
- (Steve Wilbur – Dogrib Treaty 11): your presentation referred to accidental deaths of caribou exceeding the baseline but being within the natural range. How is that possible?
 - John Virgl: the baseline was measured before the project began. Although it is possible that there may be caribou deaths associated with the mine, we do not expect them to exceed the natural variation over time.
- (Steve Wilbur – Dogrib Treaty 11): did you see any wolverine on your surveys?
 - Robin Johnstone: we saw four animals and also tracks. Wolverines were also seen around site.
- (Chris Paci – Dene Nation): is there any measure of caribou deaths due to the main Tibbitt-Contwoyto winter road?
 - Robin Johnstone: We are required to report any deaths on the Snap Lake access road. So far, there have been no deaths. I am not aware if any deaths have been reported on the main winter road, but there is a requirement to do so.
- (Robert Mulders – RWED): It can be difficult to find bears and wolverine. How can you quantify the abundance of bears and make any predictions?
 - John Virgl: We did not find any grizzly bears in surveys of the eskers. More recently, we have started gathering information from other types of terrain. We're looking for digs, scat and other evidence of bears.
 - Regarding wolverine: snow tracks do not tell us how many are in the area. We will be monitoring for deaths until more information is found, but it is very hard to set the data now.
 - Robin Johnstone: we feel it is critical to maintain the animal populations. Where there is uncertainty, monitoring becomes more important. We are trying to eliminate potential impacts.
- Follow-up question regarding grizzly reproduction rates. Discussion outside (separate notes).
- (Toivo Taal – member of the public): do you report deaths of animals to RWED?
 - Robin Johnstone: We have to establish a formal reporting mechanism with RWED. So far, the only death we have to report is that of a caribou that

De Beers Canada Mining Inc.
Snap Lake Diamond Project
Environmental Assessment – Technical Information Session
April 17-19, 2002

Summary of Questions and Answers
Day 2

appears to have been killed by wolves. Our staff found the wolves feeding on the caribou on the airstrip. They left the animals alone and, after consulting RWED, incinerated the carcass a couple of days later. This was to discourage scavengers from coming to the site. We do need to formalize the reporting method and we're working on that.

- (Tim Byers – Yellowknives Dene): will you be developing protocols around dealing with injured animals and carcasses? Will carcasses be left in place until RWED inspects?
 - Robin Johnstone: We will be discussing how to deal with injured animals. There are two main schools of thought: either you put the animal down or you left nature take its course.
 - We can work out how to deal with inspection of carcasses. I know that RWED's staff is very busy and there is a safety issue in leaving carcasses in place because they can attract predators. We can perhaps arrange to e-mail photographs of a carcass when an in-person inspection is not possible.
- (Steve Matthews– RWED): How do you measure habitat loss?
 - John Virgl: we assumed a worst-case scenario and placed a 500-metre buffer zone around the site.

Open Question Period

No questions were asked.

De Beers Canada Mining Inc.
Snap Lake Diamond Project
Environmental Assessment – Technical Information Session
April 17-19, 2002

Summary of Questions and Answers
Day 3

Open Question Period: there were no questions arising from the previous days' presentations.

Presentation: Surface and Groundwater (Don Chorley)

Questions:

- (Tim Byers --Yellowknives Dene): (referring to slide 27 in the presentation) the slide seems to indicate that the water that comes in contact with the paste backfill becomes more acidic. Is this the case?
 - Don Chorley: this reflects a conservative estimate. We are not assuming that water from any other source comes to dilute the ground water that contacts the backfill. We are conducting further investigation on the ore.
- (Unidentified member of the public): question regarding the different types of country rock around the ore deposit and the different trace metals that could be released from them during crushing.
 - Don Chorley: trace metals are higher in the various country rocks, but expect that the majority of them will be released in the processing plant, rather than in the initial crushing underground.
 - Ken de Vos: the water samples used for the modelling were taken from run-off and from the mine floor.
- (Jane McMullen – RWED): is there a monitoring program for the North and Northeast lakes (note: these are small lakes near Snap Lake)
 - Don Chorley: that is being considered, but there is no program in place right now. (Note: a baseline program was initiated recently).
- (Steve Wilbur – Dogrib Treaty 11): what data were used for the water modelling? How many wells were sampled?
 - One surface well on the northwest peninsula was tested. One-hour flow tests were conducted on seven drill holes underground.
- Follow-up question: where were these drill holes and do you think they represent the conditions over the whole area?
 - The drill holes were in the area that was excavated as part of the Advanced Exploration Program. We believe they are representative of the overall conditions.
- Follow-up #2: are your estimates conservative and do you have plans to refine the models?
 - "Yes" to both questions.
- Follow-up #3: how did you establish a baseline and how will you track changes over time?
 - We started by testing the connate water and then established a feedback loop to track changes.
- Follow-up #4: will the water deposited into Snap Lake be treated and will it differ from the baseline? If it is different, have you calculated by how much?
 - Yes it will be treated and yes it will be slightly different from the baseline, but within an acceptable range of difference.

De Beers Canada Mining Inc.
Snap Lake Diamond Project
Environmental Assessment – Technical Information Session
April 17-19, 2002

**Summary of Questions and Answers
Day 3**

Presentation: Aquatic Resources (Mark Digel and Rick Schryer)

Questions:

- Lori Forster-Clegg – Environment Canada): are the chromium levels referred to in slide 24 Chromium 3 or 6?
 - Mark Digel: we considered both because hexavalent Chromium becomes trivalent.
- Follow-up question: how did you decide that the Chromium was of low consequence?
 - First, we checked the Canadian water quality guidelines and set a local benchmark. Then, we looked for potential effects. The potential effects that we found are the lowest observable effects. Any effect that was not negligible was carried forward for further consideration.
 - Our study determined the number of organisms that could be affected and the area of the lake that could be affected. Next, we looked at the geographic extent, duration and reversibility of the effects and concluded that there was a low environmental consequence.
- (Tim Byers – Yellowknives Dene): the mine goes under spawning beds. Will there be an effect on the fish from blasting in the mine?
 - Rick Schryer: we checked blast vibrations at the point closest to the surface (nearest to the bottom of the lake) and found the effects were well below accepted guidelines. The tests were conducted in granite that surrounds the kimberlite deposit.
- (Anne Wilson – Environment Canada): What are the phosphorous levels in the mine water?
 - Mark Digel: about the same as the baseline measurement.
- Follow-up question: what is the treatment level for phosphorous in sewage and have you checked for phosphorous loading over time?
 - The amount of phosphorous from sewage is minute compared to that found in the mine water. It's about 0.2 mg per litre. We have checked for phosphorous loading.
 - (Questioner and Mark Digel agree to review the relevant section of the EA together).
- (Jason McNeil – RWED): is there a difference in the temperature of the discharge and the lake water? Will that change the habitat within the area of discharge?
 - Mark Digel: there is a potential for difference in temperature and we have plans for mitigation.
 - We will reduce the discharge water to within three degrees Celsius of the lake temperature.
 - We will use a diffuser to rapidly mix the discharge and the lake water. Any change in temperature will occur within 60 metres of the diffuser. Beyond that radius, the water will be at the lake temperature.
 - We do not expect an effect on habitat due to temperature. It is accepted that a three-degree variation in temperature is a safe limit.
- (Lori Forster-Clegg – Environment Canada): What water treatment will be conducted?
 - Robin Johnstone/Ken de Vos/Mark Digel: we intend to build the water treatment plan to meet the needs of the site. We are now identifying the level of treatment needed so a plant can be designed. Appendix 9.8 of the EA report has details of the methods that have been considered.

De Beers Canada Mining Inc.
Snap Lake Diamond Project
Environmental Assessment – Technical Information Session
April 17-19, 2002

Summary of Questions and Answers
Day 3

- (Chris Paci – Dene Nation): What is the definition of “environmental consequence”?
 - Mark Digel: environmental consequence encompasses impact magnitude over distance and time, the reversibility of the impact and its effect on life and on drinking water.
- (Chris Paci – Dene Nation): will the mining warm the lake over time? Will there be ice build-up on the vent raises and will they touch the lake in any way?
 - Rick Schryer: The vent raises will go up from the mine, to the surface on the northwest peninsula. They will not be in contact with the lake itself.
 - Mark Digel: there are at least 100 metres of rock between the mining operations and the lake water. Over the life of the mine, it is inconceivable that any warming due to mining would extend more than a few metres into the surrounding rock.
- (Chris Paci – Dene Nation): what effect would blasting have on ice forming on the lake’s surface in winter?
 - Amy Langhorne: that information is contained in an appendix to the EA report (offer to go over that information during the break).
- (Bob Turner – North Slave Metis Alliance): are you aware of Aboriginal concerns about angling being used during fish surveys and, if so, why did you use that method?
 - Robin Johnstone: We became aware of the concerns after the surveys were conducted. We used angling methods at times to meet the requirements of the Term of Reference, which say we must minimize the effects on fish. We used gill nets for parts of the surveys, because that is an accepted technique of sampling. However, angling was used during spawning because we felt nets caused too much disturbance and injury to non-target fish.
- (Chris Paci – Dene Nation): Won’t staff become alienated if they can’t fish and they can’t go outside? Where would the traditional foods for staff, specifically fish, come from?
 - Robin Johnstone: We are extremely cognizant of the need for people to get outside. It’s healthy to be outside. We’ve built that into the design of the site by having decks and areas where people can enjoy the outdoors. We’re considering walking trails. Traditional foods will be provided where they are commercially available and they will be northern foods, such as whitefish.
 - Concerning the no hunting and no fishing policy: that is in place to protect the environment at the lake.
- (Glenn Groskopf – Environment Canada staff): will drainage from the airstrip be captured and treated?
 - Ken de Vos: it is not, currently.
- Follow-up question: What about de-icing fluid from aircraft?
 - Greg Oryall: that fluid will be recycled. The fluid that falls on the apron during winter will be vacuumed up and reused. Since the glycol will fall on ice and be cleaned up promptly, it won’t have a chance to reach the soil. Glycol biodegrades quickly, but we would still take care to avoid any ponds that animals might drink from.
- Follow-up #2: will ponds re-establish following decommissioning of the mine?
 - Greg Oryall: ponds and ditches created for the mine would be drained and covered. These areas would be contoured back to the original drainage pattern.
- Follow-up #3: what about run-off from the North Pile?
 - Ken de Vos/Rick Schryer: that would go into the north arm of Snap Lake – that has been accounted for in the Impact Assessment. Since the Water Management Pond will no longer exist, spring run-off would go directly into Snap Lake. There is a small pond north of the North Pile that will be shallower than it is now because of sediment that will build up over the life of the mine.

De Beers Canada Mining Inc.
Snap Lake Diamond Project
Environmental Assessment – Technical Information Session
April 17-19, 2002

Summary of Questions and Answers
Day 3

- (Discussion of the water quality in the small pond outside. Separate notes).
- (Steve Wilbur – Dogrib Treaty 11): what assumptions did you make in creating this impact analysis? How sensitive is the accuracy of the model to your ability to gather information?
 - Mark Digel: Firstly, the project has not been built yet, so we must use modelling to predict the effects it will have. The Advanced Exploration Program consisted of mining on a smaller scale, so we were able to use real numbers in which we can be confident. We have done some pilot water treatment projects to test the models. Generally speaking, if you have good information, you can create a good reliable model. Where we did not have real information, such as from the AEP, we assumed the worst-case scenario.
 - Throughout the modelling, we assumed there would be a minimal level of treatment, even though we know that much higher levels of treatment are possible. Our predictions for discharge levels include treatment methods that we have tested and know can be achieved.
- Follow-up question: are you confident in your analysis of the groundwater chemistry, specifically of copper and aluminium?
 - Mark Digel: We took measurements during the Advanced Exploration Program. We assumed that minerals would leach into the water that is pumped out of the mine and will need to be treated before being released into the lake. Water collected on the surface will also be treated before being released into Snap Lake.
- Follow-up #2: Are you confident that the discharges into Snap Lake will meet water quality criteria?
 - Mark Digel: We used the "Goldsim" model, which considered all inflow sources and information from tests done on the rock. It also included data from pilot water treatment done during the AEP. We measured the results from the model against Canadian water quality guidelines. If there was no effect measurable beyond the 60-metre zone surrounding the diffuser, we assumed there would be no effect on the lake.
- Follow-up #3: Is it the zone around the diffuser that dilutes the content of the discharge water to the appropriate quality?
 - We plan to treat the water so that minerals and other substances are reduced to the lowest possible level. Though the year, there will be variations in the different concentrations of these substances. This is where the diffuser is very useful; it evens out the variations in the water. It is possible that, occasionally and briefly, concentrations in the mix zone around the diffuser may go above the guidelines. The mix zone comprises less than one per cent of the lake.

Presentation: Economics (Andy Swiderski)

Questions:

- (Chris Paci – Dene Nation): do the calculations in your presentation reflect today's government announcement?
 - Andy Swiderski: the calculations reflect information up to last October. It is possible to consider them in light of new circumstances.
- Follow-up question: why weren't federal grants to communities etc. considered in your calculations?

De Beers Canada Mining Inc.
Snap Lake Diamond Project
Environmental Assessment – Technical Information Session
April 17-19, 2002

Summary of Questions and Answers
Day 3

- I'm not aware of any economic model that could accomplish that. That level of data is not available.
- (Phil Kube – GNWT Dept. Finance): What would be the impact if the project had a 100 per cent northern work force?
 - Andy Swiderski: That could be calculated, if the MVEIRB requires it. The simple answer is that the benefit to the NWT would increase as the percentage of northern employees increased.
- (Jason McNeil – RWED): Can you say how much money would be spent in the NWT and in the rest of Canada during the construction and operation of the mine?
 - Andy Swiderski: we are using the best estimates available, but a lot depends on the contracting methods used and supplies available in the NWT. It is important to bear in mind the capacity in the NWT; there may be products that have to be brought in from other places. It's also important to see the broader benefit of the project to the rest of the country.

Presentation: Accidents and Malfunctions (Brian Griffin)

Questions:

- (Chris Paci – Dene Nation): What is the chance of being blown up in the mine?
 - Brian Griffin: We'd need to do a full risk assessment to answer that question. The work shown in today's presentation identifies areas where there are safety issues. This information is then used in planning the operations of the mine so that it is as safe as possible.
- Follow-up question: what is the chance of a caribou being hit on the winter road?
 - This study focussed on the management of the road. Implementing measure to avoid accidents is an operational question.
 - Robin Johnstone: notes that there have not been any deaths related to the Snap Lake winter road but does not have figures for the main Tibbitt-Contwoyto road.
- (Steve Wilbur – Dogrib Treaty 11): do you have projections for the winter road traffic?
 - Brian Griffin: yes, we have projections for the next 20 years. Current traffic was assessed at peak periods and the future increase calculated.
- Follow-up question: how was that calculated?
 - We focussed on the last four years, because traffic on the main winter road has increased 400 per cent in that time. At the same time, the accident rate did not increase, which shows that the operator of that road has been managing the increased load.
- Follow-up #2: is there a threshold where the accident rate increases, despite careful management? What is the maximum load for a winter road?
 - There shouldn't be, if the road is correctly engineered. I can't answer the question about maximum load because I am not a road engineer.
- (Steve Matthews – Environment Canada): The water treatment plant has a safety buffer – if the plant breaks down, up to three weeks of untreated water can be stored while the plant is repaired. What happens if the repairs take longer than three weeks?
 - Brian Griffin: we have assessed the potential for overflow.
 - Greg Oryall: this was discussed during the design development. The mine has back-up systems for power and water. There is some duplication of functions so that part of the plant can keep operating while another part is repaired. We also

De Beers Canada Mining Inc.
Snap Lake Diamond Project
Environmental Assessment – Technical Information Session
April 17-19, 2002

Summary of Questions and Answers
Day 3

have the three-week storage capability. As a final solution, we would stop mining and flood the mine, although that would only be done if everything else failed.

- Follow-up question: In the assessment of spills from accidents on the winter road, you looked only at lakes that contain fish. However, there are other lakes that don't contain fish but which flow into lakes that do.
 - Brian Griffin: the lakes that were assessed for this study serve as a surrogate for the whole system. The biologists did consider possible toxic effects if there was a spill into a lake that did not contain fish.
- (Steve Wilbur – Dogrib Treaty 11): can you give us a scenario of what would happen within 24 hours of a spill?
 - Brian Griffin: we expect a rapid clean up if the truck has not broken through the ice. If the truck breaks through the ice, the consequences are more severe. There could be acute effects on organisms right around the spill.
 - Stella Swanson: We considered this scenario – a truck breaks through the ice carrying a load of diesel and a full compartment (200m³) spilled into a lake. For the purposes of this exercise, we assumed the lake was the smallest that could support fish, that is one hectare by three metres deep. There are, in fact, no lakes that small beside the winter road – the smallest is 121 hectares in area. Our results showed that, even in the small theoretical lake, the spill would not permanently harm the lake. There would be some loss of plants and fish, but the effect of this would be on the low end of the scale. We predict that a spill such as the one described in this scenario would happen once in the life of the mine

It's also important to note that diesel does not mix well with water. It sits at the bottom of the lake in a glob that is fairly straightforward to clean up. We also did the test assuming a spill of a harmful chemical that mixes quickly with water. Even in that scenario, we do not predict lasting effects.

We also considered the results of a spill onto a wetland rather than into a lake. The consequences were still considered low, since a spill would be confined and treated quickly.

The "risk matrix" developed through exercises like this one helps De Beers decide where to add more mitigation and management measures. The risk to the environment is calculated by combining the toxicity of the spilled material with the amount spilled and the time it takes to clean up.

- Unidentified member of the audience: how did you choose 24 hours as the time period for your scenario?
 - Stella Swanson: we chose 24 hours because it is the dividing line between "short" and "long-term" effects.
- (Chris Paci – Dene Nation): Are you concerned about the time it takes to respond to a spill?
 - Stella Swanson: the purpose of the risk assessment is to provide a tool for planning an effective response.

De Beers Canada Mining Inc.
Snap Lake Diamond Project
Environmental Assessment – Technical Information Session
April 17-19, 2002

Summary of Questions and Answers
Day 3

Presentation: Cumulative Effects (John Virgl)

Questions:

- (Chris Paci – Dene Nation): What is your definition of “traditional knowledge”? Is it just what is contained in reports you receive?
 - Robin Johnstone: the definition for us has been what people wanted to share with us. For example, what was contained in the study done by the Lutsel K'e Dene First Nation? We have been using the definition they used in that study.
- Follow-up question: what is the ultimate goal for a cumulative effects assessment? Is the goal to clear up uncertainties?
 - John Virgl: it is easy to say that there will be cumulative effects from this project. It is very hard to say exactly how large these effects would be. There are many uncertainties. The goal is to point out these uncertainties and the difficulty in assessing effects, given the lack of knowledge and data.
 - Robin Johnstone: environmental assessment is in its infancy. There is a lack of models to predict effects and a lack of a holistic view of development. We can use environmental assessment to focus mitigation methods. It is a blunt instrument, but it can be used to identify impacts that we should manage.
- (Steve Wilbur – Dogrib Treaty 11): This study assumed six projects in the area. Are there other activities such as exploration that should also be considered?
 - John Virgl: there have been no environmental assessments done for exploration camps, so we have no data.
- Follow-up question: couldn't that be estimated? At least for the air traffic?
 - That is a very good point.
- Follow-up #2: Do you have a sense of the level of uncertainty in your study?
 - That is stated in the EA report.
- Follow-up #3: when is the level of uncertainty unacceptable?
 - My comfort level comes from looking at how much data has collected and how much Traditional Knowledge is available. If, for example, I had the same level of information for all projects I work on as I have for the BHP project, I could develop a formula. However, it is hard to extrapolate information from one project to another.
- (Sherry Lovely -- GNWT Dept. Health and Social Services): I notice the assessment looks at risks associated with animal/human contact. Did you consider human/human contact, such as people bringing a flu home from the mine site?
 - Robin Johnstone: we see that as an occupational health and safety issue. We recognize that it behoves us to have a healthy workforce.

Conclusion: John McConnell

The following question was raised during John McConnell's summary of the three-day event:

- (Chris Paci – Dene Nation): how can De Beers impose a no fishing policy at the site when Aboriginal peoples have the right to fish?
 - John McConnell: We understand that Aboriginal right, so the policy is more of a voluntary one. What we find is that, when they have it explained to them, people agree it's better not to fish at Snap Lake to preserve the environment there. The reality is that Snap would be quickly fished out if employees went fishing there

De Beers Canada Mining Inc.
Snap Lake Diamond Project
Environmental Assessment – Technical Information Session
April 17-19, 2002

Summary of Questions and Answers
Day 3

regularly. We understand that it's important for people to get outside and we will be providing forms of recreation that are an alternative to fishing.

De Beers North Lakes Technical Information Session – 9 October 2002

Attendees:

Fraser Fairman (INAC, E&C), Sevn Bohnet (INAC, Diamonds), Dave Balint (DFO), Mark Dahl (EC), Florence Catholique (Lutsel K'e Dene First Nation), Lionel Marcinkoski (RWED), Laurie Cordell (MVLWB), Bob Shelast (Stantec), Clem Paul (NSMA), Tim Byers (Dene Nation), Steve Wilbur (Yk Dene), Steve Ellis (Lutsel K'e), Jason McNeill (RWED), Mike Preston (WWF)

Golder: Pat Tones, Rick Schryer, Ken DeVos, Don Chorley, Mark Digel

De Beers: Robin Johnstone, Judy Langford, Colleen English

Pat Tones presented the results of further studies that were conducted for the North and Northeast lakes including nearby smaller lakes NL5, NL6, and NL11. Questions posed afterwards are as follows.

1) DFO:

- Could fish overwinter in NL5 and NL6?
 - No.
- During spring spawning, can fish move from the North Lake to the Northeast Lake via surface streams?
 - There are two possible routes for this, but streams on both routes are impassable due to boulder 'gardens' and subsurface flow. Access from the North Lake to NL11 and from the Northeast Lake to NL6 may be possible, but migration from one lake to the other is very unlikely.

2) Dene Nation:

- What is the definition of deep vs. shallow groundwater?
 - Shallow groundwater is the active zone, around 8 m deep. Deep groundwater is below the permafrost, including taliks connected to the deep groundwater, and is part of the regional water system.

3) Stantec:

- What are the mixing characteristics of the North Lake? Did you observe any stratification?
 - Conductivity profiles were done and no significant stratification was found. The thermal energy needed to create stratification is not available in these lakes. We also observed no stratification in Snap Lake itself. No stratification is expected in the North Lakes
- What time of year were samples taken?
 - May, so it was possible to measure under-ice conditions. Pat noted that depth profiles were done in August as well. They showed no thermocline or chemocline (e.g., temperature at surface was 11.6°C and at bottom 11.7°C).
- What criteria were used to select the metals analysis?

- The water samples were analyzed for the full range of metals and the results were included in the report. However, the report focused on only those identified as 'chemicals of potential concern' in the EA. Concentrations of all other metals in post-closure groundwater flow passing through the underground mine workings were below guidelines in the EA.
- Did you collect benthic invertebrates and compare the productivity between coarse and fine substrates?
 - We did not, because of time constraints. The benthic invertebrates in Snap Lake were known and species in the north lakes were assumed to be the same as those in Snap Lake and other Arctic lakes. Very few species were found in the coarse substrate of Snap Lake.
- How would the flow conditions at the time of sampling be classified in the creeks impassable to fish?
 - Samples were taken during the spring freshet when water levels are highest. The freshet in 2002 was typical of an average year.

4) Dene Nation:

- In the EA, cadmium in the Snap Lake sediments was above guidelines. Would cadmium have been something to look at in the north lakes?
 - Metal concentrations for sediments in Snap Lake reflect the baseline conditions. No elevated levels of cadmium are expected in the groundwater discharged to the north lakes and, therefore, no elevated levels are expected in the porewater of lake bottom sediments in the north lakes.
 - The project is not expected to increase concentrations of cadmium in sediment. Therefore, any cadmium concentrations above guidelines represent natural background conditions.

5) DFO:

- How far into the groundwater area do the wells go and how representative are the results of the groundwater flow?
 - The centre well goes to a depth of 300 m (75 m into groundwater/below permafrost, with a 25 m screen). The Snap Lake well is 150 m deep but also extends 75 m below permafrost and has a 25 m screen.
- Why were tritium levels at Snap Lake lower than other wells?
 - The tritium in the lake water is more than 10 time higher than the detection limit and peak lake water tritium levels in the lake water would have occurred in the 1950's and 1960's at values of several hundred TU. All groundwater that had entered the flow system after the early 1950's would have tritium levels ranging from about 10 TU to greater than 100 TU. Even though tritium naturally degrades over time, the peak tritium levels from the 1950's and 60's would still be observable in groundwater that entered the flow system in this time period. In all of the wells tritium was at or near the detection limit

(0.8TU). The well closest to Snap Lake had a concentration below detection, while the other two wells had concentrations near detection. These values represent natural background. The water beneath Snap is all old and precision of measurement is difficult near detection levels. The values near detection are likely due to natural conditions or very minor amounts of drilling water and do not represent relative age differences in the water.

- With present data we can say that groundwater from all wells are greater than 50 years. Somewhere between Snap Lake and the first well tritium peaks (indicating about 50 years old). If we could find the peak, it would help refine predictions, however it would require substantial effort (i.e. drilling multiple holes), for marginal benefit, and is not necessary since the current use of the data in the assessment is conservative. There is tritium in the surface water that we have found so we know that the migration rate is very low (i.e. the peak, and post-peak concentrations as measured in surface water have not even migrated to the closest well).

6) LKDFN:

- What happens to the tritium as it goes to the groundwater?
 - It will migrate as plug flow and slowly decrease.. No tritium means that the water is not from the 1950's onwards. The first well is above the expected depth of the workings and we still see no tritium.
- Do you feel confident that the well was in a good area where you could catch the tritium if it was there?
 - Yes.
- Even when considering that permeability lessens with depth?
 - As long as the wells were below 75 m, which they were, we will have captured this.

7) DFO:

- How much mixing will occur between the lakes because of the fractures?
 - We have not accounted for, nor do we expect significant mixing along the groundwater flow pathway between Snap Lake and the north lakes. The interactions accounted for are interactions between water and the rocks it passes through. The water is expected to equilibrate with the rock as it passes through the fractures. Dispersion is only accounted for within the lake bottom sediments.

8) YK Dene:

- What about travel of groundwater in other directions?
 - This will still occur, but it does not pass through the area of the mine.
- How did you measure hydraulic conductivity (K) in the wells?
 - Slug tests.

- How representative is this?
 - The mass balance provides a much better overall estimate of flow volumes. In modeling, K was uniform but higher in the horizontal than vertical direction. Slug test values were used in the hydrogeologic model.
- Was there any uncertainty?
 - Hydrogeology model results calibrated well with the relative proportions of flow to the north and northeast lakes but overestimated the quantities of flow compared to the mass balance calculations. Therefore the modelling results were back calculated based on the mass balance at to 5 to 10 times lower. . We are very confident in the mass balance results and the concentrations of parameters used for the mass balance (e.g., chloride). The differences between the measured groundwater concentrations and the measured surface water concentrations indicate with a high degree of confidence that surface water dominates the system.
- Was there any preferred flow?
 - Don't see any, but the model did account for it.
- How was the green line on the mass balance chart derived?
 - The line represents lake water concentration vs. discharge volume plotted for a range of discharge rates, assuming a constant groundwater discharge concentration of 330 mg/L.
- On the pH/Eh diagram, how does the Eh vary and what is the actual variation?
 - There is no mechanism for Eh to increase along the pathway, however observed groundwater conditions suggest it may decrease slightly as equilibrium is attained.

9) Dene Nation:

- If remediation to groundwater out of the shafts is required, is there a way of installing a chemically reactive barrier between these two areas?
 - We have been looking at alternatives in paste design. Some additives other than cement may reduce the strength of the bond with the paste backfill. Costs and logistics create a barrier to the feasibility of many options. There is no barrier *per se*. with the refinement of the numbers in this study, there is no expectation that a barrier would be required.

10) DFO:

- Estimates of inflow to the mine were made in the EA. Will these volumes change as a result of what was learned in the north lake program (i.e., because of the changes in direction of travel of the groundwater and the reduction in flow to the northern lakes?

- No, the predicted inflows presented in the EA are still appropriate as the hydraulic conductivity of the rock between Snap Lake and the mine is understood reasonably well and most of the inflow to the mine comes from the lake.

11) YK Dene:

- The baseline data taken for the north lakes indicated dust affecting the area. Are there plans to continue to collect baseline data at the north lakes?
 - Monitoring needs have not yet been identified at this point, as this is a very recent report, but this is yet to be determined for the long-term.
- Two different methods were employed for monitoring the water level decline in Snap Lake?
 - A transducer was used and is very reliable, but some redundancy was built into the study by conducting an elevation survey at various times during the monitoring.
- Could surface flow data change, whereas the groundwater will not?
 - Yes, the surface flow could change, but the relative proportions of groundwater to surface water inflow to the lakes will remain very close to the same as currently used in the calculations.

E-mail question from Environment Canada: follow-up question to the North lakes technical session of Oct 9, 2002

-----Original Message-----

From: Dahl,Mark [Yel] [mailto:Mark.Dahl@EC.GC.CA]
Sent: Wednesday, October 09, 2002 1:02 PM
To: 'robin.johnstone@ca.debeersgroup.com'
Cc: Cummine,James [Wpg]
Subject: FW: Snap Lake Diamond Project Environmental Assessment

Robin,

I just got the email below from Gary unfortunately it was too late for today's meeting but I was hoping to get a response from your guys while they were here. Thanks

Mark Dahl
Contaminants Biologist
Tel (867) 669 4734, Fax (867) 873 8185
email: mark.dahl@ec.gc.ca

-----Original Message-----

From: Spence,Chris [Yel]
Sent: Wednesday, October 09, 2002 12:03 PM
To: Grove,Gary [NHRC]; Dahl,Mark [Yel]
Subject: RE: Snap Lake Diamond Project Environmental Assessment

Gary,

I think your point is well taken. The only thing I can think of that may cause water levels to increase during the winter is if the outlet is ice dammed temporarily. If groundwater inputs are constant and surface outflow is hindered then storage (expressed in the water level) must go up.

I agree with your statements about the arbitrary period of time and the effects on their conclusions. It would have been best if they ran the program all winter and calculated daily outflow rather than made assumptions of the winter recession. The variable nature of the recession even suggests that you can't just pick a period and that you need the entire recession to get a fair estimate.

Chris

-----Original Message-----

From: Grove, Gary [NHRC]

Sent: Wednesday, October 09, 2002 11:02 AM

To: Spence, Chris [Yel]; Dahl, Mark [Yel]

Subject: RE: Snap Lake Diamond Project Environmental Assessment

Chris, Mark

Maybe this is a question that I should be posing to De Beers but here goes. If streamflow to the lake is non-existent in the late winter because streams are frozen and precipitation inputs in the form of snow loading on the ice does not affect the pressure transducer readings shown in Figure 2.1 then what causes the increases in lake water level shown on this figure? To carry on with my line of concern I would ask why these increases are not taken into account in computing water losses from the lake. I would suggest that the water level decreases in Snap Lake for the periods from March 8 to March 31 or from April 1 to April 30 are the sum of the receding limbs of the water level curve rather than simply the difference in water levels between these dates. Using Golders methodology but selecting a period from March 8 to March 26 rather than March 30 (i.e. a water level decline of 13 mm over 19 days) yields an average daily loss of 11,426 cubic metres per day from Snap Lake. This is almost double the value calculated by Golders. By using arbitrary periods of time we can make the losses be whatever we want them to be using this methodology.

Gary

Aquatic Ecosystems Impact Research Branch

National Water Research Institute

Environment Canada

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DE BEERS RESPONSE TO ENVIRONMENT CANADA'S QUESTION

Two time periods were selected from the transducer monitoring data to calculate groundwater losses from Snap Lake. These two periods encompass the entire monitoring record from March 8 to April 30. Water levels after April 30th may have been influenced by warmer temperatures resulting in some melting of the ice, therefore they were not included in the calculation.

These two periods were chosen to correspond to the two apparent long-term trends in the decline of water levels in Snap Lake. Each of these "limbs" is approximately 30 days in length. The decline in water levels over each of these intervals is less than 15 millimeters (mm), which is less than approximately 0.5 mm per day. These transducer data were confirmed by the surveyed data.

There appears to be "noise", or short-term changes in slope in the transducer data. This is not surprising considering that the magnitudes of the changes between individual measurements are generally less than 1 mm. The likely sources of the "noise" or short-term changes in slope can be ascribed primarily to two sources:

- Short-term transient events such as snow loading, and ice-blockage.
- Transducer accuracy and/or resolution.

The pressure transducer used at Snap Lake for winter water level monitoring was model KPSI-730. This is a high-quality transducer whose probe range is 0-3 pounds per square inch (psi) with static accuracy of +/-0.10% of the full scale. The maximum depth range for this type of transducer is approximately 2.1 meters (m). Thus, the accuracy is +/- 2 mm, while the resolution is 0.025% of the range or 0.5mm. The transducer was installed in approximately 0.5 meter of water below the ice cover. Given these very small values for resolution and accuracy, some scatter or noise can occur between individual measurements.

Averaging the decline in water levels measured by the transducer over a long period of time, which DeBeers has done by selecting 30 day periods, would tend to eliminate the influence of short-term transient events and imprecision and/or inaccuracies in individual transducer measurements. Therefore, the methodology that was employed to estimate groundwater outflow from Snap Lake is considered appropriate and accurate.