MACKENZIE VALLEY ENVIRONMENTAL

IMPACT AND REVIEW BOARD

ENVIRONMENTAL IMPACT STATEMENT (EIS)

ANALYSIS SESSIONS

GAHCHO KUE DIAMOND PROJECT

Mackenzie Valley Review Board Staff:

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HELD AT:

Yellowknife, NT

December 1st, 2011

Day 4 of 5

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Petr Comers	)
Anne Gunn	)
Dave Tyson	)
Doug Ramsey	)

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--- Upon commencing at 9:02 a.m.

THE FACILITATOR HUBERT: Okay, good morning everybody. It's Chuck Hubert with the Review Board. I'd like to get started this morning with some -- some of the follow-up activities that De Beers was going to present for us from -- from yesterday.

Just to remind everybody, I'm Chuck Hubert, panel manager with the Review Board here. With me is Alan Ehrlich, formerly known as the panel manager, and assisting, hopefully, and as well as Nicole Spencer.

Once again we are webcasting, and for those participating remotely we are on day 4. You'll find that on the Review Board website, a PDF.

And I -- I will talk about the agenda for today later on, but for now I'd like to turn the mic over to De Beers for the follow up from -- from yesterday, please. Go ahead.

MS. VERONICA CHISHOLM: Veronica Chisholm from De Beers. Thank you, Chuck. First off I'd like to have Cathie Bolstad from De Beers, she would like to provide some clarification from November 29th, 2011.

MS. CATHIE BOLSTAD: Good morning,

everyone. I had an opportunity last night to read the transcripts from day 2 and saw there were two (2) things I said on the record that I needed to correct myself on. On page 180 I said I had met with the Mine Training Society chairperson and executive director. And I -- what I should have said was I met with the Mine Training Society chairperson and general manager. To be clear, I met with Ted Blonden, chair of the Mine Training Society, and Hilary Jones the general manager.

On page 181 in my response to industry, tourism, and investment, when they asked a question about how we would deal with shutdowns and closure to transition employees, I answered that we had outlined in a meeting with communities and regulators in October our approach to the temporary shutdowns. In fact, the meeting was actually on November 1st and it was a meeting between De Beers and a variety of GNWT departments, including industry, tourism, and investment. My apologies for those errors.

MS. VERONICA CHISHOLM: Veronica Chisholm, from De Beers. Thank you, Cathie. So I'm just going to provide some follow-up responses from yesterday. That would have been November 30th, 2011. So project GHDs (phonetic) and relative comparisons with other diamond mine operations in the region, that information will be provided Thursday, December 1st, 2011, or today in the afternoon.

I have a copy of the caribou health report we mentioned yesterday for Madelaine, so I just have it in hand as soon as she arrives. There was a question by Fred Sangris from the Yellowknives Dene First Nation regarding what is the existing and forecasted traffic on the Tibbitt-Contwoyto winter road. I'm going to read the response.

"Records of his -- historic traffic, both commercial and noncommercial, on the Tibbitt-Contwoyto winter road are presented in Section 11.8.2.5 of the EIS. Traffic forecasts for the Gahcho Kue projects are provided in 11 -- Sections 11.8.3.2."

And we have a hard copy of that, so if Fred shows up we would be delighted to show him those sections and those numbers.

In response to James Hudson, CWS, on Wednesday, November 30th, 2011, regarding the ecological risk assessment and the deliverable timing, and if the water management pond will be considered, a detailed environmental risk assessment was not included as a requirement of the TOR (phonetic). And as -- and as the work related to compiling a detailed technical background document was ongoing at the time of the EIS submission. The document was not included at that time.

In 2011, additional field data was collected and is now being incorporated into the ERA as well as some additional air information. Once this information is collated the final ERA technical background document will be produced. We anticipate that it will be completed by the end of Q2 2012.

And in answer to the question was the water management pond considered in the ecological risk assessment, the answer is, yes.

There was a question from you, Alan, regarding the relative change and abs -- the use of absolute areas in the wildlife section or the wildlife slides from yesterday.

Summaries of absolute changes from direct effects and vegetation types are summarized for the regional study area in Section 11.12.1, species at risk and vegetation. For moose, musk ox, and birds we provided areas per habitat quality, poor, low, good, high, only for the reference landscape. However, absolute numbers can be easily extracted per condition or scenario.

For example, in Table 11.11-10 of the EIS the amount of high quality habitat for the reference condition is 274,213 hectares. And the percent change for high quality habitat from reference to baseline 2010 is 4.2 percent. That was what was referenced on the slide, minus 4.2 percent. Thank you. That's what was referenced on the slide yesterday.

Thus, the absolute area for the baseline in 2010 is 274,213 hectares minus the product of 4.2 percent times 274,213 hectares. That's a lot -- a big mouthful. And I think that is the response we have for that one (1) unless there's a follow-up.

In response to Mr. Petr Comers' questions from Wednesday, November 30th, the use of significance in the assessment and the addition of TK significance. In response to the question asked by Mr. Comers regarding community impact rating, it's important to clarify that the EIS presents predictions made by De Beers on likely residual effects from the project and then determines the significance of those effects.

The use of this -- of the term "significance" in the context of the environmental assessment has a specific meaning. Significance in the EA context is determined based on factors commonly used in EAs such as magnitude, duration, direction, geographical extent, and these factors are outlined in Section 3.2.2 of the terms of reference. It is on this basis that we arrive at our significance determination. And we have made our significance determination in accordance with the terms of reference.

We understand that people in the community, and indeed people participating this week in person, or via the web, may have different views of significance to them. In the context of the project EIS and the environmental impact review process, we have made our significant determinations based on proven EA practices and our predictions of likely residual effects. We also are confident in our approach of making predictions based on the conservatism incorporated in our impact predictions and resulting significance determination.

Now we only want to be clear on what we understand. Just because the EIS determines something as not significant, or not likely to be significant in the EA context, this does not mean that these issue are not important to people, or not significant to people as that term is used in its every day meaning.

De Beers welcomes feedback from stakeholders and the local communities on our EIS and the predictions contained within and we look forward to further engagement with stakeholders in hearing about matters that are important to them in the IR process. We understand that these issues are very important to people and they are also very important to De Beers. Because these issues are important to De Beers is why the project has been designed proactively to integrate environmental design features that protect the environment and also avoid or reduce project impacts to the greatest extent possible.

Question 2 -- oh, question.

MR. ALAN EHRLICH: Thanks for that response, Veronica. It's Alan Erlich. I appreciate the -- the -- the -- the obvious thought that's gone into it and, you know, you raise a -- a compelling argument.

It's the onus of each party to prove their case, and of course the best judges on how significant potential impacts might be to the Yellowknives are, you know, the people who are -- are -- are best able to describe that are probably the Yellowknives when it comes to providing evidence to the panel. Which means the question that was raised by Dr. Petr Comers yesterday probably would be better put to the Yellowknives than to De Beers. De Beers is only responsible for providing its own views on -- on what it thinks the predicted impacts are going to be, so thank you for that.

MS. VERONICA CHISHOLM: Thank you. Veronica Chisholm from De Beers. I -- I do want to address Dr. Comers, I'll make that correction, sorry about that. A second question regarding restoration of pre-development vegetation types and reclamation practices, just to provide some clarification on the response from yesterday.

Reclamation for the project will be progressive to determine the best approach. De Beers will use lessons learned from current active mine site including Ekati, Diavik, and Snap Lake. Part of the reclamation/revegetation plan will include the use of native species capable of supporting the overall goals and objectives of the reclamation plan, such as stabilizing soils, providing productive and functional vegetation ecosystems to support wildlife species, including caribou.

It's important to understand that the assessment does not consider reversibility to mean the landscape and vegetation ecosystems will be immediately restored to predevelopment vegetation community types. Arctic environments have slow processes -- processes, and at closure vegetation are predicted to be in early successional stages that will evolve into late successional stages or climax communities over time.

As such, reclaimed areas will likely provide different but similar function -- functional vegetation community -- community types in the areas that are not influenced by the project. The point is that reclaimed areas are not expected to be the same as pre-development conditions. Therefore, the assessment results is not dependent on returning the reclaimed areas to pre-development conditions for pre-development vegetation types. Thanks. I have a couple more.

THE FACILITATOR HUBERT: Chuck Hubert. Thanks for clarifying that. Please continue.

MS. VERONICA CHISHOLM: We're almost there. Anne Gunn's question from Wednesday, November 30th, 2011. Yesterday.

First question:

"It is unclear how the developer has consistently and thoroughly drawn on the experiences of other mines."

Our response:

"Subject of note, waste management and wildlife in Section 11.9 provides a review of the wildlife effects mitigation and environment dev -- design features used at Ekati, Diavik and Snap Lake, as well as the Jericho mine, including a review of all wildlife incidents at these mines, dating back to 1996. Through this review, several improvements to the environmental management were identified, including redesign of the inert solid waste facility, and plans to enclose the incinerator. De Beers will continue to liaise with other operators on proven technology and proven practices.

Wildlife effects miti -- effects mitigation and management plan, in Appendix 7.1, draws heavily on the lessons learned at Snap Lake, Ekati, and Diavik mines. All the mitigation and waste management prin -- principles, management of toxic substances, wildlife deterrent, caribou production, and worker education was developed and then tested at Ekati, Diavik and Snap

Lake. Key lines of inquiry, caribou, Section 7, makes extensive use of monitoring -- of the monitoring completed to date and the lessons learned at Ekati, Diavik, Snap Lake and Jericho. This section referenced reports from Ekati, Diavik, Snap Lake and Jericho over fifty (50) times. The Meadowbank project is not considered to be -- to be as relevant information as Ekati, Diavik, Snap Lake and Jericho, because it uses a different monitoring protocols and the access is from a new all-season road from Baker Lake, while Ekati, Diavik, Snap Lake, and Jericho access from the seasonal Tibbitt-Contwoyto Road, which has been operating for thirty (30) years. Nevertheless, we will continue to follow developments in wildlife effects monitoring in the region with great interest."

Anne Gunn's question on the cumulative effects of climate change un -- underestimate -- underestimated, or the assumption that it was underestimated in the EIS. De Beers would request that this question be formally read into the record to insure clarification of the question.

THE FACILITATOR HUBERT: Chuck Hubert, Review Board. That question was, in fact, read into the record and is on the transcripts from yesterday. However, we can read it again.

MS. VERONICA CHISHOLM: Veronica Chisholm, from De Beers. It would be great if you could read it again.

THE FACILITATOR HUBERT: So, this -- you want to read it?

MR. ALAN EHRLICH: Just be -- it's Alan Ehrlich. Just be one (1) minute. We're looking over the transcript so we can provide you with a nice, accurate read.

MS. VERONICA CHISHOLM: Veronica Chisholm, from De Beers. Thank you very much.

(BRIEF PAUSE)

MR. ALAN EHRLICH: Hi there. Ready to go. Thanks for waiting a minute there.

Here's what I'm reading off the transcript yesterday and I'll -- I'll leave out anything that I think makes it less clear.

"Dr. Gunn asked whether or not the cumulative..."

I'm reading from the -- from yesterday's transcript. I don't have a time on this, but if it sounds like deja vu it's because these same words came out of my mouth yesterday.

"Dr. Gunn asked whether or not the cumulative effect of climate change has been sufficiently estimated. She notes at Section 11.13 -- in Section 11.13.5 the residual effects summary of the environmental impact statement states that 'all the pathways for climate change were detire -- determined to have no linkage or minor secondary changes to the classification of effects from the project on the biophysical environment.' She writes: 'That appears to indicate that there were no primary effects of climate change, only three (3) secondary pathways, these being waterflow, processed kimberlite storage, and the winter

road season.'
Given the ten (10) year period of construction and operation and predictions of further climate change Dr. Gunn was interested in the propoment -- the proponent's confidence that a warming climate will not cause measurable changes with residual effects on a valued component relative to baseline.
Dr. Gunn notes that: 'There was no discussion in the EIS of the current rate of warming relative to non-linear and unpredictable effects and increase in annual and seasonable variability.' Her example regarding caribou is: 'Population modelling indicates a large effect on caribou abundance from changes in the level of insect harassment to which any effects of the mine would be additive. It's not -- it's -- to which any effect would be additive. Insect harassment is temperature dependent and is predicted to be more

severe under a -- under a warmer
climate.'"

The transcript reads "client", we do not have a client of any warmth. A warmer climate.

"'In that case effects of the mine
additive to the effects of a warmer
climate would have residual
effects.'"

And that is the point from Dr. Gunn who is participating remotely yesterday and I -- I believe this morning that we've asked De Beers to comment on.

Does that reiterate it sufficiently?

MS. VERONICA CHISHOLM: Veronica Chisholm from De Beers. I appreciate that, Alan.

Yeah, I think that does provide some clarification on the question. De Beers at this time would like to request that this be under -- be an undertaking so that we have sufficient time to provide the detailed response to this question.

THE FACILITATOR HUBERT: Chuck Hubert, Review Board. Thanks very much. That's Undertaking number 2, for the record. And December 16th is the response date for for De Beers for these first two (2) undertakings and any that might follow. Thanks.

--- UNDERTAKING NO. 2: Is the cumulative effect of climate change under-estimated? Section 11.13.5 residual effects summary states that "all of the pathways for climate change were determined to have no linkage or minor(secondary) changes to the classification of effects from the Project on the biophysical environment." That appears to indicate that there were no primary effects of climate change only three secondary pathways. Given the 10 year period of construction and operation and predictions of further climate changes, is the proponent confident that a warming climate will not cause measurable changes with residual effects on a

VC relative to baseline.
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unpredictable effects and
increase in annual and
seasonal variability

THE FACILITATOR HUBERT: And were there any other items? One (1) -- Veronica, please.

MS. VERONICA CHISHOLM: Thanks, Chuck. It's Veronica Chisholm from De Beers. I just have one (1) more.

De Beers requests clarification of -- on the question from the Yellowknives Dene First Nation, I think it was delivered by Stephen Ellis, on -- regarding the persistent organic pollutants with reference to dioxins and furans. We would just like to seek some clarification on the question so that we can develop an appropriate response. Thank you.

THE FACILITATOR HUBERT: It's Chuck here. Steve, would you like to respond to that?

MR. STEVE ELLIS: Well, only to divert the -- the question. Steve Ellis here with the

Akaitcho Dene.

I can't really answer that question. So maybe wait until Todd comes here this afternoon and I'll ask him. I'll send him a little note right now saying that's he's wanted. Okay.

THE FACILITATOR HUBERT: Chuck Hubert with the Review Board. Thanks very much, Veronica, for the responses to the follow-up homework from yesterday. That's excellent.

So welcome everybody. We'll start with today's agenda. Once again, I'm -- my name is Chuck Hubert with the Review Board, with Alan, and Nicole, and Paul, and Jessica in the back.

I'd like to remind everybody here that there's a sign-up sheet in the back, and it helps our transcription imme -- immeasurably, if that's -- people do sign in with that.

Again, we have remote participation. Remote participants are encouraged to check our website for the day 4 topic, which is water, including hydrology of groundwater, permafrost, and hydrology. We have -- we have it listed as, Aquatics, I believe on our -- on our website.

I'd encourage people with cell phones to keep them off, or on vibrate, so please no sound. As well, when -- when speaking if you can introduce yourself -- self by name and organization prior to -- to speaking.

As far as presentations go, we'd prefer if the presentation can run though in -- in its entirety, and questions are held off until the presentation is complete.

Also, we have a Tlicho terminology handbook which has been prepared by De Beers.

MR. STEPHEN LINES: Sorry, Chuck, it's Stephen Lines for De Beers. It -- flip the book over, it's actually bilingual.

THE FACILITATOR HUBERT: Thank you for that clarif -- Chuck Hubert. Thank you for that clarification. And this -- this terminology handbook can be found on the back table, and -- and we will have copies as well in our office, the Review Board office.

As well, we -- we do have translators in the room today, so if -- if required the translators will be available to in both.

So with that, the agenda today is, again, water and aquatics, and I'd like to request De Beers to introduce their team, and -- and proceed as they would like. Thanks.

MS. VERONICA CHISHOLM: Veronica

Chisholm from De Beers. John Faithful from Golder will be presenting the introduction and overview, and he will be introducing the aquatics team that will be presenting today.

PRESENTATION BY DE BEERS CANADA RE INTRO

MR. JOHN FAITHFUL: John Faithful, Golder Associates. Thank you, Veronica. I'm going to provide a couple of slide intro before I introduce the -- the aquatics team, if that's -- if that's okay.

So, good morning. I'm going to talk to you today about the aquatics assessment for the Gahcho Kue project. Thank you very much to all of you who are attending, both in session today and also remotely. We've very excited to share our work with you on the aquatic's assessment. It represents a considerable and comprehensive piece of work.

Initially, I'd like to first thank Aboriginal Affairs, and their staff and consultant, for some early feedback on the EIS. We'd also like to thank the parties that provided questions and comments at the October workshop. These comments are very useful, and as appropriate, have contributed to the presentation today, and probably tomorrow.

We're on slide number 2. The table that

we've presented, you've seen on a number of occasions in presentations over the last few days. The table is a guide for the location of all of the sections that are rele -- relevant to the aquatic environment in the EIS.

There are two (2) omissions to this -- to this table. One (1) is Section 5, particular referencing Section 5.4, which describes how traditional knowledge was incorporated into the aquatic's assessment, and the aquatic's baseline data collection.

The presentation today will specifically focus on four (4) sections of -- of the assessment, two (2) key lines of inquiry, which is Section 8 and Section 9, that is water quality and fish in Kennady Lake, and downstream water effects. And it will also focus on two (2) subjects of note, those being Section 11.2, Impacts to Great Slave Lake, on Great Slave Lake, and Section 11.6, Permafrost, groundwater, and hydrogeology.

We're going to integrate the two (2) key lines of inquiry in our presentation today, rather than discuss them independently, so that there is natural flow to the assessment. We'll not specifically focus on the long term biophysical effects key line of inquiry that is Section 10, as this section provides a summary of the long-term assessment findings from Sections 8 and 9. That is from the -- for res -- with respect to the closure phases.

The only information that is not addressed in Sections 8 and 9 within Section 10 is the conceptual closure and reclamation plan. This was presented by Veronica, from De Beers, on Monday as part of the project description presentation.

Section 11.6, which details the work on hydrogeology and groundwater, is provided within the key lines of inquiry presentation that will be initiated earlier through today.

Section 11.2, the subject of note on impacts to Great Slave Lake, will be provided at the end of the presentation tomorrow.

The existing environment information or baseline information is presented as annexes and addenda within the EIS.

Some of that information will be summarized by each of the presentations that you will hear today from the discipline leads. These will include hydrology, hydrogeology, hydrology, water quality, and fish and aquatic resources.

Although not listed on this on this

table, the permafrost baseline information is also provided in an annex, that is Annex D. This is the bedrock geology, terrain, soil and permafrost baseline.

The addenda that you see in addition to the annexes provide baseline -- supplemental baseline information that was collected in 2010. That is it -- the -- the addenda contained more recently collected baseline information. And as you see from the table, they're presented for the hydrology, water quality, and fisheries, and aquatic resources.

I'm now on slide 3. The terms of reference for the aquatics assessment were very comprehensive and stated that the EIS must detail any effects of the project on Kennady Lake and downstream waters. Rather than go through the large list of each of the requirements within the terms of reference for each key line of inquiry, and subject of note, we can extract and summarize key elements of the terms of reference requirements for the key lines in -- of inquiry, and they're listed on this slide.

So, for example, the first bullet is specific to Section 8, the key line of inquiry to water quality and fish in Kennady Lake, which required a detailed analysis of all impacts on fish abundance, health and fitness for consumption, including a comprehensive analysis of potential effects on water -- impacts on water quality, and that the emphasis must be placed on the ability of the lake system, particularly fish and fish habitat, to recover.

For Section 9, downstream effects, where the analysis of water quality and fish in Kennady Lake identifies potential impacts. Where uncertainty exists, the EIS must provide an evaluation of the potential downstream effects and the extent of the impact.

I'm now on slide 4. This provides a summary of the assessment findings for Sections 8 and Section 9. We found that the impacts from the project will not have a significant negative influence on the assessments endpoints that were used for each of those sections; i.e., that the suitability of water quality to support a viable aquatics ecosystem in Kennady Lake following its re-connection to the downstream watersheds, and in the downstream waters during operation and closure, and on the abundance and persistence of desired populations of fish species in Kennady Lake following its re-connection to the downstream watersheds and in downstream waters. Fish are predicted to return to Kennady Lake after its -- after construction and operations. They'll be healthy and they'll be available for traditional and nontraditional use.

This assess -- assessment, as John Virgl pointed out on Tuesday and Wednesday, as part of his assessment approach -- actually, it was Monday and Wednesday -- is based on the weight of evidence from analysis of primary -- primary pathways to effects on valued components. The assessment that was undertaken by the aquatic disciplines within the EIS was based on multiple assessment approaches and endpoints for key aquatic components. This was a requirement for the terms of reference and was critical in reducing uncertainty in the predictions.

The EIS considered a suite of conservatisms through the assessment, and those will be very clearly outlined in the assumptions that the discipline leads present in their presentations today. As a consequence the impacts should not be worse than have been predicted in the assessments.

I'm now on slide 5. The slide that is now presented provides an outline of the aquatics assessment that you will -- that will be presented to you guys -- presented to the parties and the audience over the next two (2) days. I'll initially provide an introduction to the aquatics team. I'll provide an overview of the assessment. We'll speak specifically to the two (2) key lines of inquiry, Sections 8 and Section 9. We'll follow a format to the dis -- follow a format similar to -- to the way that the disciplines have presented their information in the key lines of inquiry.

We will init -- start initially with the hydrogeology presentation. That will be followed by hy -- hydrology and geochemistry, then water quality, fish and fish habitat, the recovery of Kennady Lake. I will then provide a summary of the assessment conclusions and we will finish up with a -- with a presentation on the subject of note, impacts to Great Slave Lake.

I'd like to take this opportunity to introduce the discipline presenters that you will hear from today and tomorrow. I'll ask you just to either raise your hand or stand up, whatever you're comfortable with doing.

I'd like to introduce Don Chorley, who will speak to the hydrogeology and groundwater discipline. Nathan Schmidt, who will speak to the hydrology. Ken De Vos who will speak to geochemistry. Mike Herrell water quality, and Gary Ash fish and aquatic resources and the recovery of Kennady Lake. Within each of the -- the aquatic discipline presentations the presenters will provide a discussion of the enviro -- or a summary of the environmental setting, describe their assessment methods, and provide their assessment findings.

We're now on slide 6. It looks a lot darker than I recall. The project area is located at -- the proposed project area is located at Kennady Lake. It's 140 kilometres northeast of Lutsel K'e and 84 -- 84 kilometres east of the Snap Lake mine. The Diavik and Ekati mines are approximately 120 to 130 kilometres to the northwest of the project area.

Kennady Lake is a headwater drainage with a drainage area of 32.5 square kilometres, constitutes approximately .1 percent of the Lockhart river watershed. Within the Kennady Lake watershed about 35 percent of the surface area is water. From Kennady Lake to the outlet of Kurt Lake, the drainage are of 739 square kilometres constitutes approximately 3 percent of the Lockhart river watershed of which 25 percent of the surface is water.

The local topography is characterized by rolling rocky ridges, low-lying muskeg, and numerous shallow lakes. Kennady Lake and other lakes in the local study area are typically low -- low subarctic tundra lakes with ice cover extending for seven (7) to eight (8) months of the year. There is a short-term open water period that extends from four (4) to five (5) months. This typically occurs between June and October. These lakes are expected to have low productivity.

The area is quite dry relative to most of Southern Canada, with a main annual precipitation of approximately 340 millimetres. Half is rain and half is snow. Flows in streams and lakes are dominated by spring runoff with lesser flows and water levels through the subsequent open water season.

Much of the area is over -- is underlain by permafrost with taliks underneath larger lakes.

A comprehensive understanding of the existing environment has been developed through the baseline programs that have been conducted for this project. They continue to be undertaken for some of the aquatics components and the terrestrial components, including hydrogeology, hydrology, water and sediment quality, and fish and fish habitat, those being the aquatics components, not the terrestrial components.

I'm on slide 7, which presents a figure showing the conceptual approach to the aquatic effects analysis. John Virgl, on Tuesday, explained that the assessment approach used in the EIS is a process that identifies and assesses environmental effects from the project and provides a determination of significance on those effects to key aquatic assessment endpoints.

This is a similar figure that was provided in John's assessment approach presentation on Monday, and Cam Stevens' terrestrial presentation yesterday. It provides a diagrammatic view of the assessment concept that is being applied to the aquatics key lines of inquiries.

On the left hand side, you can see that we have the project, which includes the environmental design features and mitigation to negate or reduce the potential for various effects to the environment, plus the existing environment superimposed on the project -- or, with the project superimposed on the existing environment.

Of most importance in this diagram, as identified in the terms of reference, is the focus on the assessment of effects to water quality in fish, which were key components to be addressed -- key topics to be addressed in the aquatics key lines of inquiry.

These are the assessment points -- these are the assessment endpoints in the aquatics assess -- assessment, which are listed on the right. That is, the effects -- suitability of water quality to support a viable aquatic ecosystem, and the abundance and persistence of key fish populations within the lakes, and for use from a traditional and non-traditional point of view.

What I would like you to note is that there is a box in the centre of this diagram, which provides a list of all of the other aquatic components. This includes groundwater quality and quantity, surface flows and water levels, water quality, aquatic health, and fish and fish habitat.

The analysis of effects to these components is an important element in the assessment of each of the aquatic components, either directly or in combination, and have a -- which have -- either directly or in combination, have an influence on the suitability of water quality to support a viable aquatic ecosystem, and on the abundance and persistence of fish in Kennady Lake and downstream waters.

Traditional knowledge has been considered in the project design and considered in the environmental assessment. Some of the aspects of the assessment that traditional knowledge was applied was associated with the habitat evaluation procedure in the habitat compensation options planning process, which is located in Sections 8 point -- Section 8.10, and consideration of refilling Kennady Lake as quickly as possible to facilitate a shorter time frame for lake recovery.

These and other elements of traditional knowledge that were used in this manner, are discussed in Section 5.4. On the issue of traditional knowledge, I responded to a question by Steve Ellis on -- on Tuesday, on the incorporation of traditional knowledge into the EIS. And I may have left the impression that traditional knowledge was not incorporated. The reference to this is page 35 of Volume II of the transcript.

To clarify, although De Beers had not received TK studies specifically undertaken by communities for the project area, traditional knowledge was incorporated into the assessment. I've provided some of these examples above, and provided a reference to the section where more detail is listed.

Now on Section 8 -- page 8 -- slide 8. Consistent aquatic value components have been used in the aquatic key lines and subject of note. This allows for consistency and to carry potential effects through from Kennady Lake to the downstream watershed.

These include, as outlined in the previous -- as -- as -- as mentioned in the previous slide, permafrost, groundwater chemistry and quantity, water flows and water levels, water chemistry, sediment chemistry, fish habitat, low atrophic organisms, which include phytoplankton, which are small algae that exist in the water column of the water -- of streams and lakes, includes zooplankton, which are small crustaceans, small animals that exist also in the water column and its streams, largest -- larger benthic organisms that exist in the substrate of the lakes and streams, as well as forage and large bodied fish.

The selection of the key aquatic components for the aquatics key lines of inquiry and subjects of note were determined from various sources; those include the issue scoping sessions with community members, Federal and territorial regulators, and other stakeholders, which provided the basis for identifying and prioritizing issues and -- and important aquatic components that are identified in the terms of reference. As well, sources of information were reviewed as part of the traditional knowledge study program, which is outlined in Section 5.4.2.2 of the EIS.

All the of the aquatic components were characterized as being important components, but water quality and fish were determined to be the most important topics within the terms of reference for these sections. Hence, their inclusion as key lines of inquiry topics.

Therefore, for the -- for these key lines of inquiry, the ultimate properties of water quality and fish provided the basis of the assessment, which resulted in the -- in the key -- in the key assessment endpoints being the suitability of water quality to support a viable aquatic ecosystem, and the abundance and persistence of desired populations of key fish species.

I'm on slide 10. The suitability of water quality provides the basis for evaluating aquatic ecosystems, to determine whether water quality during each phase of the project, construction, operations, and closure, and into the post-closure period, meets acceptable levels for the protection of aquatic life. Substantial changes to water quality may affect fish, wildlife, and human health.

In order to determine the significance of potential project effects to the suitability of water quality, effects to the key aquatic components, such as permafrost, groundwater quality and quantity, water levels and flows, and water and sediment chemistry, were evaluated. Its changes to these components influence this assessment endpoint. For example, changes in the quality and quantity of groundwater provide measurement endpoints that they use to assess effects to surface water quality, as an example.

I'm now on slide 10. Fish are important to traditional and non-traditional land users and also provide a direct link between potential effects to water quality and human health and wildlife heath.

As for the suitability of water quality assess -- as for the suitability of -- of wat -- as to -- as to the assessment endpoint that describes the suitability of -- of water quality, the assessment of potential effects to key aquatic components such as water levels and flows, water and sediment chemistry, lower trophic organisms, and fish habitat we use to determine the significance of potential project effects to the abundance and persistence of key fish populations.

For example, fish habitat is important to the sustainability and viability of fish, and project activities that affect fish habitat will ultimately affect fish. Similarly, measures, such as environmental design features or mitigation taken to reduce effects of fish hab -- to a fish habitat, will reduce effects to fish.

On slide 11. The key fish species that we used in the key lines of inquiry as assessment endpoints were Lake Trout, Arctic Grayling, and Northern Pike. To focus this assessment valued fish species were characterized as being important to people, and these were selected from the list of fish species that are present in Kennady Lake and downstream waters.

The selection criteria that was used to select these key fish species is outlined in Section 8.5 of the EIS. The cri -- criteria included traditional importance of fish species to communities which were indent -- which was identified through traditional knowledge, as outlined in Section 5.4, their current status with the Committee on the status of endangered wildlife in Canada -- I think the acronym is COSEWIC, COSEWIC -- the Species of Risk Act, SARA, or the Government of the Northwest Territories. There are no federally listed fish species in the local study area, or regional study area, although Arctic grayling are listed as sensitive -- as a sensitive species in the Northwest Territory.

There are no other sensitive, or maybe at risk species in the local study area, or the regional study area.

Other criteria included evaluation of the relative abundance and distribution of these fish species in the project area, their unique life history characteristics or requirements, and their current ecological niche. Again, the detail around these selection criteria are provided in Section 8.5.

There was another selection criteria, which was the economic importance to traditional and non-traditional land uses, such as commercial sport fisheries.

At the time of the -- that the EIS was submitted, there was no commercial fishery within the regional study area. Therefore, the importance of a fish species to commercial fishing was not included as part of the selection process.

(BRIEF PAUSE)

MR. JOHN FAITHFUL: Lake trout is the most abundant predatory fish species in Kennady Lake, accounting for approximately 20 percent of the large bodied fish community.

In addition, lake trout is one (1) of the most highly valued fish species for food by communi

-- local communities who have fished in the Lockhart River watershed. It is a prized fish species in the Northwest Territory for resident and nonresident sport anglers.

Its suitability as a key fish species is that it completes all of its life history in lakes, so it is appropriate for assessing changes to lake environments on fish.

Lake trout is a cold water fish species, sensitive to changes in temperature, dissolved oxygen, and water quality. As it is a long-lived predatory species, it's suitable for assessing the effects of metals or other substances that have the potential to bioaccumulate.

Also as a predatory species at the top of the food chain, it's suitable for -- for assessing changes in lower trophic levels in the forage fish community.

(BRIEF PAUSE)

MR. JOHN FAITHFUL: Northern pike was also selected as a key fish species. It's pop -- population is relatively small within Kennady Lake and the downstream waters, and it's restricted to areas where aquatic macrophytes exist.

It's also important to communities and to Northwest Territories sport fishery. Its suitability as a valued fish species is because it is dependent on aquatic macrophytes for spawning, rearing, and foraging, so it is an appropriate species for assessing effects on fish from potential water level fluctuations.

As pike are primarily a predatory fish, it's appropriate for assessing changes in forage fish communities in lakes and streams.

The project has the potential to affect water levels in these small lakes, in addition to the water level in Kennady Lake. Water level fluctuations may increase or decrease on the -- the abundance of aquatic vegetation in these lakes, and also their distribution, hence its suitability as a valued fish species.

Arctic grayling is an abundant large bodied fish. It has an effluvial life history, which means that it lives its life in lakes, but uses the streams for spawning and rearing. It's rated as a sensitive fish species in the Northwest Territories, and it is important to communities and the Northwest Territories sport fishery.

Its suitability as a valued fish species is based upon its dependence of stream habitat for spawning and rearing, so it is appropriate for assessing effects from changes in physical and hydrological characteristics of streams on fish, that being changes in flows, water levels, channel regime, water quality, and drift.

As juvenile Arctic grayling feed on zooplankton, which are small crustaceans that live in streams and in lakes, and adults primarily -- primarily feeding on insects, it's appropriate for assessing the effects on the lower trophic organisms.

(BRIEF PAUSE)

MR. JOHN FAITHFUL: I'm now on slide 12. It provides an overview of the pathway analysis. As John Virgl presented on Tuesday, the evaluation of project effects to the key aquatic components included a screening level assessment which considered design feat -- environmental design features and mitigation, experience, traditional knowledge and science to distinguish no linkage secondary, which are minor, and primary pathways.

The pathway analysis considered

potential link -- linkages between the project and the key aquatic components so that there is a project activity. The pathways effectively show that work between a project activity through to a change in -- in the environment where -- where it is observed and an effect to a valued component.

No linkage in secondary pathways are not predicted to have significant residual effects on the key aquatic components. The rationale for the -- for their -- for their characterisation as a no linkage in secondary pathway is provided in the EIS and they cannot consider it further in the effects analysis part of the assessment.

An example of a no linkage pathway is an impediment. The pathway would be an im -- impediments to fish passage as stream crossing may affect fish. The environmental design feature that would limit or mitigate that effect would be the installation of a culvert across the stream.

When the culvert is installed over fish bearing -- when the culvert is installed over fish bearing streams that would allow fish passage upstream and downstream across that -- between that culvert.

An example of a secondary pathway, the pathway would be the release of sediment to Area 8 during the construction of a dike which may change water and sediment quality and affect -- affect fish habitat and fish.

The environmental design feature to mitigate those effects of potential elevated suspended sediment to area -- to the water in Area 8 would be the use of silt curtains and monitoring to reduce the potential for elevated total suspended solids extending through Area 8.

There may be a minor change to -- and localised change to total suspended solids around the Area 8 where the silt curtain is presented, so it presents a minor change relative to baseline conditions or guideline levels; however, it would have a negli -- negligible residual effect on water quality.

Primary pathways require further effects analysis and a classification to assist potential significance of impacts to -- to the va -- valued component assessment endpoints. This is consistent with the assessment approach that John provided on Tuesday and that which Cam and John described yesterday for the terrestrial environment.

I'm now on slide 13. The next two (2) slides are just going to provide an overview of the study areas that have been used for the aquatics assessment. They're typically consistent between some of the aquatics components. However, there'll be aquatics components, such as hydrogeology, that have a -- have their own study area, and I'll leave those discipline leads to -- to actually present the -- the study areas as appropriate as they move through their presentations.

It is common practice in environmental assessments that regional and local study areas are established. The study areas that -- that are common amongst the aquatics disciplines are similar in size to those that are used at other mine locations in the region.

For the regional study area in this assessment and for the majority of the aquatic components in the assessments presented today, as I've mentioned, the regional study area represents the entire Lockhart River watershed to its outlet into Great Slave Lake.

The regional study area was selected to capture any effect that may extend beyond the local study area that could potentially interact with other existing and proposed development projects to cumulatively affect hydrology, water quality, fish and aquatic resources.

For those remote attendees, I'm pointing to the slide -- pointing to the regional study area. I'm pointing out the location of the Gahcho Kue project area in relation to the -- the regional study area. Flows from the -- the Kennady Lake watershed move northwards to Aylmer Lake. They then exten -- extend eastwards -- eastwards before moving south towards Artillery Lake and then into Great Slave Lake.

The Lockhart River drains into the east arm of Great Slave Lake. The area of the Lockhart River system is 26,600 square kilometres and the area of the Kennady Lake watershed is 32.5 square kilometres, which represents .1 percent of the Lockhart River watershed.

I'm now on slide 14. The local study area extends from the outlet of Kennady Lake, which is to the northwest side of the red watershed located at the la -- the bottom of that diagram -- of that figure.

To the outlet of Kirk Lake to the north. I think the outlet is just to -- in the second last cell on the top right-hand side of the figure and includes all of the associated watersheds such as the end watershed, which is the watershed immediately to the north of Kennady Lake watershed, as well as the 'L' and the 'M' watersheds that drain to the northwest --

northeast, I should say, of Kennady Lake through Lake 410 into the P Lake watershed and then into the Kirk Lake watershed.

This area was selected to capture direct effects from the project with respect to hydrology, water quality, and small scale indirect effects on the environment such as changes to water quality from deposition of air emissions and, therefore, represents an appropriate study area for most of the surface water-based disciplines.

As I mentioned before, some spatial study area boundaries for other disciplines such as groundwater and hyd -- hydrogeology are different. And those study areas will be presented in -- in those groundwater -- in those appropriate aquatic's presentation.

That provides an overview and introduction for the aquatics presentations that are going to follow today.

Don Chorley with hydrogeology will be the first aquatics discipline lead to present his information. Thank you.

Chuck, if I may, I'll just make some clarification. I think I alternated between describing when John Virgl provided his assessment approach presentation. I think I alternated between Monday and Tuesday. It was, in fact, on Monday.

QUESTION PERIOD:

THE FACILITATOR HUBERT: Chuck Hubert. Thanks for that clarification. Thanks -- and thanks very much for the aquatics overview presentation, as well. Perhaps we can entertain a -- a question or two (2) if there are any from people in the seats. Go ahead.

(BRIEF PAUSE)

MR. JULIAN KANIGAN: Good morning. It's Julian Kanigan with Aboriginal Affairs. I just had a question about the local -- well, the study areas in general. So the local study area, did I hear you say that it's meant to capture potential effects from the air leading into water, basically, that pathway, so any dust or air emissions that -- that could lead into water quality effects?

MR. JOHN FAITHFUL: Thanks for your question, Julian. John Faithful, Golder Associates. From -- from a project -- project-based emission source, Julian.

MR. JULIAN KANIGAN: It's Julian Kanigan again. So what I -- I guess the gist of my -- where I was going with it was is -- to me it looks like the local study area heads north and that's where the water flows.

In terms of air though, it's not bound by where the water's flowing. So could you maybe discuss how -- or if the local study area is large enough to capture, say, those concerns you might have from air going to the south?

(BRIEF PAUSE)

MR. JOHN FAITHFUL: John Faithful, Golder Associates.

(BRIEF PAUSE)

MR. JOHN FAITHFUL: John Faithful, Golder Associates. Thanks, Julian. The air emissions effects would be considered from the regional study area point of view.

MR. JULIAN KANIGAN: It's Julian Kanigan again. Just one (1) more followup. So I -- I believe and -- and I'm thinking in terms of cumulative effects now, that the Avalon project is in the same general area?

I'm not sure, though, if it's in the same watershed. So I'm wondering in terms of -- of aquatic effects if that's been factored into your assessment. They both flow into Great Slave Lake, though, I believe.

MR. JOHN FAITHFUL: John Faithful, Golder Associates. The local study area was defined by the watersheds of the lakes and streams that may be directly affected by the proposed project, and it includes Kennady Lake downstream to K -- Kirk Lake. Existing and planned projects in the Northwest Territory are located outside the local study area. As such, there is no opportunities for releases of those projects to interact with those within the Kennady Lake watershed downstream to Kennady Lake.

Consequently, there is no potential for cumulative effects to water and fish in Kennady Lake and downstream of Kennady Lake, as per our assessment.

THE FACILITATOR HUBERT: Chuck Hubert. Thanks very much for the question and answers. Any further questions from parties?

If not, I'd like to ask De Beers to proceed then, with the next presentation topic, please.

PRESENTATION BY DE BEERS CANADA RE PERMAFROST, HYDROGEOLOGY, AND GROUNDWATER:

MR. DON CHORLEY: Thank you, John. My name is Don Chorley. I'm with Golder Associates, a senior hydrogeologist there with thirty (30) years of experience in hydrogeology, much of that in Canada and much of the work in Canada in northern Canada.

I will be speaking about subject of note permafrost, hydrogeology and groundwater. If we go to slide...

(BRIEF PAUSE)

MR. DON CHORLEY: Okay. I'm on slide 18. And this is the introduction and it describes why an understanding of hydrogeology is important to protect the environment at this project.

The project will res -- result in temporary changes to the local groundwater regime -- regime. An under -- understanding of these changes and the quality and quantity of groundwater inflow to the mine is required, so that the project can be developed to be protective of the environment.

The projections of groundwater inflow quality and quantity provide inputs in addition to precipitation and surface water flow in the development of the water management plan for the project, which is also developed to be protective of the environment.

So the purpose of the hydrogeological investigation and analyses is to assess these changes and the groundwater inflow's qual -- quality and quantity.

I'm on slide 19 now. This slide pro -- provides a summary of what our findings are and also our approach. The rest of my presentation will look into this in greater detail, provide the methods, and detail on the findings.

Conservative assumptions were built into our assessment to provide a high degree of confidence that effects on groundwater quantity and quality and surface water quality as a result of changes to the groundwater have not been underestimated. And I'll show you what those conservative assumptions are.

Mining will result in temporary changes to the local groundwater regime. However, we have found that no measurable differences in lake volumes outside of the immediate Kennedy Lake area -- it's been called the controlled area in the project description, are projected to occur due to groundwater flow to the mines. And we've also found the following mining groundwater levels in quality will return to conditions similar to those of current or baseline conditions.

I'm now on slide 21. This shows the local study area for the hydrogeology. And as John stated earlier it's different than the -- for the surface water. The reason why is that in the North, in areas of continuous permafrost, the catchment, if you like, for the groundwater is different from the surface water and that will become a little bit clearer when I -- as we go through the slides. The area -- local study area includes enough of larger lakes so we can assess the regional flow directions.

I'm now on slide 22. The environmental setting or the baseline is defined by published work and various surveys in site investigations. Here provides a list of the investigations that have occurred on site basically from 1996 to late 2005.

I'm on slide 23. This is a map showing the location of some of the boreholes. These are the boreholes that are most important for us in terms of the hydrogeology. There was a lot more boreholes than this, but I want to just point out some of the ones that are important.

Those of you that are not here, I'll just say that there's four (4) Westbay instruments at the site there on both sides of the Kennady Lake. These are important monitoring wells because they have multilevels, average about eleven (11) levels per well and you can sample water at different elevations. So it provides you depth and locations of chemistry and you can see the variation of chemistry with them.

These ones are located -- oops, sorry.

(BRIEF PAUSE)

MR. DON CHORLEY: These wells are located here at -- it's 136, which is north of the campsite which is where the Gahcho Kue symbol is. There is 238 which is mainly west, 24 -- 240 which is southwest, and 239 which is close to the campsite.

In addition to this, the red triangles are -- are deep thermistors so we can determine the depth to the bottom of the permafrost and those are located in the -- to the southwest of the camp. And this -- this bisomber (phonetic) -- this thermistor is to estimate the depth of the permafrost that is not influenced by large lakes, and then we have one (1) in each of the two (2) islands within Kennady Lake.

I'm on slide 24 now. In areas of continuous permafrost the hydrogeology is controlled by permafrost characteristics, distribution, and spatial and temporal dynamics.

There is generally two (2) primary flow regions in the -- in the Arctic in continuous permafrost, and there is at this site. There's a shallow groundwater regime, and this consists of an active layer that is up to 4 metres deep -- thick at the -- at the surface, and this is only unfrozen during the warm months during the summer. And then there's a deep groundwater regime that's below the permafrost, and this is laterally continuous. And at this site it's about -- the depth to the permafrost that is not influenced by lakes is about 300 metres.

There is little hydraulic connection between these two (2) regimes, and that's because of the very low hydraulic conductivity of the permafrost. I think a definition of hydraulic perma -- conductivity would be appropriate here.

Hydraulic conductivity is the ability of soil or rock to transmit water. So if you have a high hydraulic conductivity you'll have -- you'll transmit more water than a low hydraulic conductivity. Also, permeability is often used interchangeably with hydraulic conductivity, so if you have a high permeability you'll transmit more water than a low permeability.

Also important for flow -- groundwater flow in the north is the taliks. This is unfrozen ground belev --beneath lakes -- large lakes. A lar -- taliks will develop under large -- large and deep lakes that extend right down to the deep groundwater flow regime, that regime that's below the permafrost.

I'm on slide 25. This is a schematic that shows the groundwater regimes in the -- at the site. What you can see is that -- whoops -- areas located away from -- from the -- from the influence of lakes, they have the deep permafrost; it's about 300 metres deep. Hearne Island, or one (1) of the islands within Kennady Lake, it's influenced by the thermal regime of the lakes, and so it's only about 100 metres deep to the bottom of the permafrost.

Groundwater flow in the -- in the deep groundwater regime is basically controlled by the -- just the elevations -- relative elevations of the lake, so it flows from higher elevation lakes to lower elevation lakes. Shown on here also is the active layer. This very thin layer, the red layer.

I'm on slide 26. The shallow groundwater, as I said before, is a seasonal flow. It's about 4 metres thick. It basically follows the topography of the -- surface tofog -- topography, so basically it flows downhill to -- to lakes in the area, generally at rates of a few centimetres per day. Shallow groundwater has very low salinity. Basically it's fresh water, and is relatively uniform throughout the local study area.

The deep groundwater, this is the groundwater regime located below the permafrost, is predominately controlled by lakes that have taliks that extend through the -- through to the deep groundwater flow regime. Laterally extensive, very slow because of the low -- relatively low permeability. We're talking about half a metre per year, so very slow.

On -- on this map, there's some elevations. The elevations on the lakes on this map is only lakes that have -- have taliks that extend down to the deep groundwater regime, so for example there's a lake towards the east of -- of Kennady Lake, and that -- that lake is not large enough to have a talik that extends down to the deep groundwater regime.

Based on this, as I said, the differences in groundwater, the groundwater flow directions are controlled by the differences in water -- water levels in the lakes. Basically the flow from Kennady Lake goes towards the east, or southeast on a regional scale.

I'm now on slide 27. And this is -- this slide shows the hydrostratigraphy in -- at the site. Hydrostratigraphy is really just soil or rock units that are of importance to groundwater flow. And so we've divided it in a number of zones here.

First there is a till which is at the bottom of the lakes and on the surface, a thin veneer of -- of till. Then there is the shallow exfoliated rock. Now, exfoliated rock developed because this area was covered by a thick sheet of glacial ice, and when the glacial ice melted a portion of the outer surface of the bedrock, because of release of pressures, is a little bit more fractured than the -- than the deeper bedrock. So this is more permeable than the deeper re -- at -- at the site it's -- we estimated it's about 60 metres deep, this exfoliated rock.

Then we have the deep competent bedrock below this exfoliated rock. And what we have found is that the bedrock, generally this is -- we see this at all places. It -- it generally becomes less permeable with depth, and this is because the way the rock on top tends to squeeze the -- the fractures. So we have seen this at this site too.

The next one (1) is the kimberlite,

which is relatively low permeability. The contact zone. The contact zone around kimberlites tend to be higher permeability than the -- than the competent rock and the kimberlite, and they are here.

And structures. I -- the next slide, slide 28, talks a little bit more about these structures. There's some structures -- primary and secondary structures have been identified by geophysics but also confirmed by boreholes.

Primary structures are considered to be -- are interpreted to have continuous strike extensions greater than tens of kilometres. So that means they're continuous over that. Those areas where it is secondary tends to be a little bit more local, so they'd be in kilometres.

There was -- there's two (2) secondary faults in the structures in the -- at the site that have been identified, and those are the ones through the Hearne pit and through the 5034 pit. A primary structure has been identified through the Tuzo pit. There was a number of boreholes intersected the -- these structures at this site, but they found that the permeability was very similar to the competent rock.

Slide 29. Slide 29 presents a graph showing that the -- how the TDS increases with depth in the north. Basically, all over the Canadian Shield, which extends from Ontario, Quebec, Manitoba, up into the north, this has been found, that there's TDS increases with depth, basically related to very ancient water that has diffused up.

The shallow groundwater samples collected from water wells in the active layer, this is basically freshwater in the local study area. The deep groundwater, we produced a profile here, and you can see on the graph that the TDSs along the top increasing and depth is along the left side.

So as you increase the -- the depth of the project is about here, 300 metres. The pit's about 300 metres. It's about four thousand (4,000) -- a TDS of four thousand (4,000). What we -- we produce this profile so that we can actually simulate it in the numerical values, and I'll discuss how we do that a little bit later on.

How we defined this profile is based on data from the site if it goes down to about 500 metres depth. And then we tied it into data from other sites. It's pre -- pretty consistent in -- in the Canadian Shield that you get this profile. There's a number of profiles here, Diavik, Lupin, a lot of data from Lupin, Meadowbank. But the -- the one (1) that we have chosen is that one (1) to the -- the black line.

Also what we do is -- the relationship of other water quality constituents are -- are -- that change with depth are correlated to this TDS, so we can use that. Some of the constituents don't vary with depth.

QUESTION PERIOD:

THE FACILITATOR HUBERT: Chuck Hubert, Review Board. I'm going to stop you right there. It's about twenty (20) after 10:00. Thanks for the presentation. I especially liked your defining of terms, very good, and I'm sure that's very helpful.

But before we break I'd like to entertain a few questions from parties, if they're out there, on this latest segment of the presentations.

MR. STEVE ELLIS: Yes, Steve Ellis, with Treaty 8 Tribal Corporation. When I say, Treaty 8 Tribal Corporation, Akaitcho Dene means the same thing, so sorry for confusing that. I confuse even myself sometimes with that.

Just with regards to permafrost, I'm just trying to find the reference in here. Just can -- can you go through the studies that were used to characterize the permafrost regime around Kennady Lake?

There's some reference in here on one (1) slide to a 2004 study, but I'm not sure if there's more, or if that's it.

(BRIEF PAUSE)

MR. STEVE ELLIS: Yeah, Steve Ellis here. I found the reference here. It's pa -- slide 22 where it speaks to the baseline studies at Kennady Lake area. The only one (1) that says permafrost is the 2004 study.

I'm just wondering if any of the other ones provided information that helped in the characterization of the permafrost regime.

MS. VERONICA CHISHOLM: Veronica Chisholm, from De Beers. Thanks, Stephen, that's a good question. We would like to spend a bit of time sort of getting a thorough answer for you, so we'd like to either do that after lunch. Okay?

MR. STEVE ELLIS: Just the reason that this is important for me anyways, is that on slide 24, if we can go there, it says that...

Yeah, just when we're talking about the shallow groundwater regime and -- and the active layer, it says:

"Ephemeral system that is only
unfrozen during summer."

I had, I guess, the fortune last week to sit through a series of presentations about the active layer currently in the Northwest Territories from a bunch of permafrost scientists with INAC actually.

And they've come to the conclusion that in many areas throughout the Northwest Territories, especially up and down the valley, and around the Yellowknife area, that the active layer is not freezing at all in many areas.

And those of us that live in and around North -- Yellowknife remember what happened at Baker Creek with the -- essentially the -- a big ice jam filling up, and that was because the -- the water through the active layer was flowing all -- all winter long.

So that is clearly of concern. If -- if climate change is imp -- is having impacts up here and is resulting in a active layer that is not freezing completely, or at all during the winter months, that, from our perspective, would dra -- would drastically change the -- the -- the shallow groundwater modelling regime.

So I think that's why it's important to

understand where this information came from.

MS. VERONICA CHISHOLM: Veronica Chisholm, from De Beers. So just to clarify your question, Stephen, it's to provide some of the baseline references and information around Kennady Lake?

MR. STEVE ELLIS: Yeah, Steve Ellis. Yeah, that's exactly correct. Just understand what studies, and if you could even provide the references to those studies, just indicating how the permafrost regime in and around Kennady Lake was characterized, so.

That -- you know, you're basing a lot of your re -- or your conclusions on -- on some assumptions that the permafrost regime is frozen for most of the year, so we'll look into that.

MS. VERONICA CHISHOLM: Veronica Chisholm, from De Beers. We'll provide a response to that question, a response after lunch. Thanks.

THE FACILITATOR HUBERT: Thanks very much. Chuck Hubert, with the Review Board. Thanks very much for those questions and responses. I'd like -- okay. Go ahead.

MR. JULIAN KANIGAN: Thanks, Chuck. It's just -- it's a follow up for Steve's question. It's Julian Kanigan with AANDC. One (1) area that we've -- we've kind of been looking at in the EIS and wondering if maybe we're not finding it is climate baseline data for the site.

So when I say climate I mean air temperature and precipitation, those type of things that you would capture with the MET Station. The reason I ask and why it's pertinent to this question is, in order to know what's going to happen in the future with climate warming we need to know what the conditions are currently at the site. And so I -- probably it's in the documents somewhere and maybe you could just provide me with the reference.

MR. NATHAN SCHMIDT: Nathan Schmidt from Golder. The climate baseline is -- is incorporated in the hydrology section. So in Annex H, Section H-4, there's a discussion of -- should be what you're looking for.

MR. JULIAN KANIGAN: Thanks, Nathan. It's Julian Kanigan again. Just to clarify, it's data that's been collected at the site?

MR. NATHAN SCHMIDT: There's site specific data collected on site as well as regional data. Nathan Schmidt.

THE FACILITATOR HUBERT: Chuck Hubert, Review Board. Another question from -- please approach the microphone and state your name, please.

MS. VELMA STERENBERG: It's Velma Stevenb -- sorry, Velma Sterenberg from AANDC minerals. I have a comment and two (2) questions if we have time for that.

First of all, I'd like to say how happy I was to see that Golder put bore holes down the primary and secondary structures. It's very gratifying to see that those structures are being looked at.

My first question would be: What was the density of the bore holes along the structures with regard to the proximity to the pipes? And could you perhaps provide that information later, if -- because it's probably a little bit too involved a question to answer immediately?

MS. VERONICA CHISHOLM: Veronica Chisholm, from De Beers. Yeah, we'll -- we'll look for that response and provide that. I -- I'm sorry, if -- can you just clarif -- can you just restate that question?

MS. VELMA STERENBERG: Okay. What was the density of bore hole studies relative -- along the primary and secondary structures, based on proximity to the pipes?

And the second question I have is based

on observations of various mines in the Shield and off the Shield in the Northwest Territories and Nunavut. And I was wondering if Golder had a chance to look at some of the conjugate fractures -- fracture systems and the movement of groundwater in some of those systems as well as primary and secondary structures?

And did they have to -- I mean, that would be a fairly intensive survey, but there should be some kind of fracture set related to the local study area and was that looked at?

MR. DON CHORLEY: Yes. Don Chorley with Golder. We did look at some of the other ones. There's some minor structures that have been identified between the -- between the pipes.

And I was just going to say something about your other question. It's too bad we didn't get on to the assessment, because that might answer some of your -- your -- because what we do in the assessment, we actually assume that those structures are permeable. Okay? Thank you.

MS. VELMA STERENBERG: Velma Sterenberg, AANDC. Thanks very much for your information. I look forward to the rest of the stuff.

THE FACILITATOR HUBERT: Chuck Hubert, Review Board. Yes, thanks for that response and we'll perhaps defer further questions until the -- your next part of your presentation.

In the meantime, it's 10:30. Oh...

MR. PAUL GREEN: It's Paul Green with Aboriginal Affairs water resources. This is just a follow on to what Stephen was talking about. Just a comment that one (1) of the implica -- like, there are several implications that the permafrost isn't freezing back. There's both the -- the actual volume of water movement and timing, we well as some water quality implications related to ions and nutr -- nutrients movement through the active layer. So just comment, just a comment that those are areas to consider.

THE FACILITATOR HUBERT: Chuck Hubert, Review Board. Thanks. And with that, we'll take a fifteen (15) minute break. It's 10:32 right now. So see you in fifteen (15) minutes.

--- Upon recessing at 10:32 a.m.

--- Upon resuming at 10:51 a.m.

THE FACILITATOR HUBERT: Chuck Hubert with the Review Board. Welcome back, everybody. I'd like to give De Beers the opportunity to continue with their presentation, Assessment Methods and Findings from Hydrogeology.

Please proceed.

CONTINUED PRESENTATION BY DE BEERS CANADA RE PERMAFROST, HYDROGEOLOGY, GROUNDWATER:

MR. DON CHORLEY: Thank you. This is Don Chorley of Golder.

I'm on slide 31 now. Now the groundwater quantity and quality model was developed using MODFLOW and MT3D. This was used to evaluate the effects to the surrounding lake levels, effects to surface water quality.

The groundwater model was designed to project the following: quantity of groundwater reporting to the pits during operations and closure, projected concentrations of total dissolved solids in the groundwater inflow, and projected contribution from the lake water, Kennady Lake.

I'm on slide 32. And this is actually an animated slide. So unfortunately, the people that are not here won't be able to see the animation. The first -- the first part of this animation is what we saw before which is the baseline conditions, the groundwater conditions. And the second part of the animation is what happens when the pit is -- open pit is put into -- in the mine. It causes some reverse in flow. I'll try to explain this to the people that aren't here. It causes reversal in flow as the groundwater is induced to flow into the pit.

I'm on slide 33 now. Now this just shows a 3-dimensional projection of the numerical hydrogeologic model. Now what the numerical model does, it's -- it's built within the computer and it's -- you put all of the information you've learned from the baseline conditions into the model. For example, the elevations of the lakes with those thru taliks, the extent of the permafrost, the hydraulic -- hydrogeologic parameters that hydraulic conductivity values, and all those different layers that I talked about, the till, the exfoliated bedrock. It also puts in the total dissolved solids with depth profile.

So we look at what the initial conditions are and then we put the mine plan in and see what the -- and simulate the mine plans to predict or project what the inflows to the mine are, both quality and quantity.

Okay. Now, I said in summary at the front that we used a very conservative approach, that -- and this -- this discusses it. Remember that hydraulic conductivity is a measure of the ability of a soil or rock to transmit water. So if you -- if you assume a higher hydraulic conductivity, then it's going to be higher inflow, and actually higher upwelling from the higher TDS water.

What we've done at the site, as -- as I said, a conservator -- conservative approach was used in applying these hydraulic conductivity values. First, we increased the geometric average of the hydraulic conductivity of the -- all units, except the potential permeability zones and the exfoliated rock where the -- the increase was greater by a factor of three (3). So most of the rocks we increased it by a factor of three (3); three (3) times.

We assumed the bedrock structures even though we did not measure that there was an enhanced permeability zone within those structures. We assumed that these structures were permeable, and that they were 30 metres wide. That's based on experience with -- with diamond mines in -- in the north.

We assigned arithmetic averages of hydraulic conductivity. What ari -- arithmetic average does is it -- it -- if you have a range of values it tends to use the highest values. It tends to be towards the highest values for those that you measured in those units. And we used those for both the -- the exfoliated rock and the enhanced permeability zones, which are the structures -- related to those structures. And we assume in the model that those structures are continuous over long distances.

Also important for the -- for the TDS upwelling from the deep -- deeper more higher TDS water, we assumed that the hydraulic conductivity below 500 metres was basically the same as that -- it is at 500 metres depth. In reality, we expect the -- the permeability to get less with depth. What this does is it allows -- the simulation allows more of that TDS water to -- to move up into the mine.

That's when I was talking about those potential enhanced permeability zones, basically those primary and secondary structures. We just assumed that they were continuous and under -- under Kennady Lake. That's where the -- it's most important because that's were most of the flow is going to be, is from the water management pond, and 30 metres wide.

I'm on slide 36, and this just shows our finding. This is a table, and it's -- I just want to -- this table just shows the detail in which the -- the mine plan was simulated in the model. Basically the -- if you look at the first column where it's predicted inflows, the 5034 pit is developed first. And the inflow is -- increases until about year 5 when the Hearne pit starts to get online, and then the Hearne pit has taken some of the water that's -- would normally flow to the -- to the five thirty-four (534).

Similarly, the Tuzo pit is developed last, and it starts affecting the inflows in the other two (2) pits. Also on this is the TDS that is estimated for the -- each of those pits, and so they -- they vary from up to fifty-two hundred (5,200) parts per million of TDS.

Also on here is a lake contribution. Now, this might be a little bit clearer when -- when Michael talks about the GoldSim model because what this does is it provides a back loop for the GoldSim model. For example, you'll be discharging this water into the water management pond, and then some of that water will be coming back into the -- into the pits, so it will be picking up TDS. And so that provides that loop percent contribution. Almost all of this water is coming from the area, what is called Area 35, in the water management plan.

The final columns are -- are just the pit elevations that were simulated in the mine plan. The ones that have the 'A' on it is the -- some of the pits starts to -- water -- the water level starts recovering in those pits, and that's just the water level, because that's what's important for the -- for the simulation of inflows.

As I said, these prediction of inflows, TDS concentrations and percent lake water, are used as input to the GoldSim model, which is kind of -- calculates the concentration in the surface water.

I'm on slide 38. We did some sensitivities too to get a handle on what -- how they could vary. Model sensitivity number 1, what we looked at -- oops. Sorry -- sorry, slide 37. Okay, we un -- undertook two (2) sensitivities.

One (1) is we looked at -- to any testing we did at that potential permeability zone indicated that it was similar to the competent rock, so we took that out. We realized that this would be kind of the lower bound case of the inflow and -- and effects.

Sensitivity 2, we also kept that potential enhanced permeability zone out, so we ha -- made it the same as the hydraulic conductivity of the competent rock, but we increased the -- that TDS profile by twice as much. So we'll show you the results of that.

Part of the -- the reason we didn't do -

- increase the TDS and leave the enhanced permeability zone in there is because I said before that we were very conservative on the hydraulic conductivities. And if you start -- if you are conservative on the hydraulic conductivities and conservative on TDS, then you're going to end up with something that's overly conservative because that upwelling really relies on that hydraulic conductivity. And if you're conservative -- you've got conservatively high hydraulic conductivity in the deep zone, then it's going to allow a lot more to -- to flow up into the -- the mine. So I -- we considered that to be overly conservative.

What we found was that -- model sensitivity 1, this is where we just removed the enhanced permeability zones, make them the same as the background. As expected, we get generally 40 percent less inflow and the predicted groundwater quality is somewhat better, but not -- a little bit lower concentrations of TDS.

Sensitivity number 2, it protects TDS conturation -- concentrations, not -- not unsurprisingly, about one point five (1.5) to two (2) times greater than the base case model. But the overall TDS, because the inflow is less, inflow quantity is less, is very similar to the base case.

Now, when you -- at closure what will happen is that the -- the Tuzo pit will be slowly filled with water over a nine (9) year period. What happens is, as the pit is being development it induces groundwater flow to go up into the -- up into the mine.

Once the water level in the -- in the pit has reached, basically its current conditions, what happens is that you have this heavier TDS water that wants to sink by gravity because there's no other -- there's not a hydraulic gradient any -- anymore, so it -- it wants to sink down back to where it was before.

How to analyze this, we had to use a density dependent model. This is FEFLOW. So FEFLOW looks at both groundwater flow due to hydraulic gradients and then looks at -- at the TDS due to density gradients, basically wanting to flow down.

The next slide, this is 40, it just goes through the sequence of what you would see at the Tuzo pit. First of all, this has got the current conditions. You have higher TDS groundwater at depth.

The next slide, 41, shows when the pit is completely developed. You have this higher TDS water that moves upward due to hydraulic gradients. Okay? So it's moving up. Those overwhelm the density gradients. This is during mining.

42 is when we start closure. So there's water going into there over that nine (9) year period. As the water starts filling up the pit, the hydraulic gradient becomes less and you start to get these density gradients that wants to pull that TDS down.

This -- slide 43, is near the end of closure, when the pit is completely flooded. There's still a little bit of -- of flow due to the hydraulic gradient, but it's starting to be dominated by the density gradients that wants to sink that down.

And finally, the -- 44 is the post closure. That the -- the TDS has -- has, after a period of time, has gone pretty close to present conditions -- gone back to present conditions.

And slide 45, this just shows the -- the model grid that was used for assessing the -- that post closure condition. It's got permafrost in it, section through there -- density.

Slide 46 presents the results of this density model, and it's groundwa -- in the first one hundred (100) years, groundwater inflow rates to the flooded pit -- this is due to density, it wants to go into the flooded pit, varies from .5 metres cubed per day to 3 metres cubed per day.

The higher end is -- is mostly within the first year. The lower end is for most of the rest of the hundred years. Just to give you some idea of -- of these values, the high end, 3 metres cubed per day. An average home faucet when it is open full, is about 40 metres cubed per day. So that's more than ten (10) times more than that -- that value right there. And it's a hundred times more than the -- the low end of that. About a hundred times more.

So -- and we also predicted what the TDS flux into the pit -- flooded pit. It ranged from 300 grams per day to 4,500 grams per day. The higher value occurring in the first year and then getting less and getting to 300 grams per day.

What -- these values were then used in the hydrodynamic model to estimate what the -- what the stratification was in the -- in the pit -- in the Tuzo pit. And that'll be discussed later.

Slide 48 is just an assessment summary. The project will have a negli -- a negligible effect on groundwater quantity. And there was no measurable differences in lake water volumes outside of the controlled area in our simulations.

Conservative assumptions is built into the model to provide a high degree of confidence that effects on groundwater, both the quantity and quality, and surface water quality as a result of these changes in groundwater, are not underestimated. And here's an example. We used the upper bounds of the hydraulic conductivities. We assumed that those enhanced permeability zones were there.

Simulated groundwater inflow results and concentrations will be validated during operational monitoring, and this will give us an opportunity to optimize the water management system.

That's the end of my presentation. Thank you.

QUESTION PERIOD:

THE FACILITATOR HUBERT: Chuck Hubert, Review Board. Thanks very much for that. I'd like to open it up to the floor for a few minutes of questions, at least. If anybody has a question, raise your hand and state your name prior to the question, please.

MR. MARK CASAS: Yeah, thank you. Hi, my name is -- sorry -- Mark Casas. I'm with the Mackenzie Valley Land and Water Board and I just -- I just have one (1) quick question about -- it sort of relates more towards the closure of the -- I'm trying to find the page that had it -- where you're talking about after -- as the pit is filling that it's going to be based mo -- mostly the -- on the density -- it'll be separated by density.

And I was wondering in terms of the pit filling, what -- like, I guess a lot of that density is based -- it's assuming that the water that's going into the pit is -- is relatively low in TDS.

Is that right? In order to make that, that gradient, like, strong enough to keep the -- the TDS water in the bottom, and then the water going in would have to be of a low TDS.

So I'm wondering how you determine the TDS of the water going in, like, that's going to fill the pit?

MR. DON CHORLEY: Okay. Well, first -- sorry, Don Chorley of Golder.

That -- that simulation is continuous. We used the MODFLOW model to predict where the various TDS is so that -- that'll -- and then we used that as initial conditions in the FEFLOW model so that that density is covered there, right.

So what you'd look at is that it knows -- the model knows that what the density is at various points along the pit and that's actually what's simulated in the hydrodynamic model.

I don't know if I answered your...

MR. MARK TASIS: Yeah. Mark Tasis. Yeah, I -- I'm not sure either. I think -- I think so. I guess -- yeah, what I'm saying is I'm not sure how it -- how it can predict the -- the densities of that water if its not sure what the -- like, we don't really know what the TDS is going to be like when that water fills us, right. There's also going to be -- it's probably going to be of a higher TDS than -- than it is right now because I'm assuming it's going to be filled with water that -- that's been let back into the -- into the area that's been de-watered, right.

So I guess that's where I'm getting at is that it' not -- it's not fresh, really low TDS water. It could actually have a reasonably high TDS, in which case there won't be as strong a gradient to keep --

MR. DON CHORLEY: I understand.

MR. MARK TASIS: Okay. Thanks.

MR. JOHN FAITHFUL: Thanks, Mark. John Faithful. So you -- you're correct. The -- the pit inflows are going to be dominated by the surface water which are going to have a low TDS. And that that gradient will be generated and the hydrodynamic model will develop that -- that gradient differential in terms of its modelling.

MR. MARK TASIS: Yeah, Mark Tasis here. I guess, I don't -- how do -- how do we calculate or how did you guys calculate the low -- low TDS for the -- for the water to go in the pit?

I guess that's -- that's just my -- I mean, I don't think we necessarily have to answer this right now. It's just sort of something to -- to keep in mind in terms of -- of when determining whether all the TDS is going to stay in the bottom of the pit, it -- it certainly will depend on -- on the TDS or -- or density of -- of the water that's -- that's being put in there. So that's just -- that's just a -- a concern I wanted to raise, that's all.

Thank you.

MR. JOHN FAITHFUL: Thanks, Mark. The -- the TDS concentrations in the -- in the surface water inflows were modelled in the water quality model that, Mark (sic) Herrell will speak to in a little while and that will be for during both operations and in early stages of the closure when the pit is actually being refilled.

John Faithful, Golder Associates.

THE FACILITATOR HUBERT: Chuck Hubert, Review Board. We look forward to that presentation or discussion to come.

Any further questions?

MR. PAUL GREEN: It's Paul Green with Water Resources. Just a quick one (1).

The -- the slides appear to assume it was going to be a pit, sort of empty at the end of -- of -- when the -- when the groundwater began to refill. But I understand some of the pits will actually have some fine processed kimberlite, perhaps some waste rock in the bottom.

Will -- how -- will that change or what will that -- how will that effect the assumptions you've made on -- on the refilling or what -- I guess, what -- how will that be different than a pit with nothing in it when it comes to the -- to the TDS and the groundwater coming back in, if at all?

(BRIEF PAUSE)

MR. JOHN FAITHFUL: John Faithful, Golder Associates. Thanks, Paul. Can you -- can you restate your question, and just clarify the -- whether you're talking about im -- impediments to inflows from the groundwater in terms of what Don presented?

MR. PAUL GREEN: I'm not sure that I'm

referring to impediments. I'm just -- I'm just under -- my understanding was that many of the pits will have, you know, fine process kimberlite in them.

And I was just wondering if your slides would look any different, or if your -- your description would have been any different if, you know, assuming fine kimber -- fine process kimberlite in the bottom of the pit, or if that won't really affect the -- the infilling at all, or your assumptions on the whole.

That's -- that's just kind of what I was curious.

MR. DON CHORLEY: Don Chorley. It won't affect the infilling. In fact, if you have some sediment there, then -- then the lake dynamics get a little bit different because, you know, you have a smaller amount of actual lake in there, open water, if you like, water column, but it won't affect the -- the inflow estimates or anything like that.

I showed on that one (1) really complex table that we actually accounted for the water levels coming up in -- in the other pits in the Hearne, and 5034, and in Tuzo, the water level recovering.

Yes, this -- this one (1) here, the water level recovering over time, that's what those --

the superscript 'A' means, that -- it means that's not the bottom of the pit, it's -- it's the pit starting to recover.

MR. PAUL GREEN: Okay, thank you.

THE FACILITATOR HUBERT: Chuck Hubert, Review Board. I'll end the questions there in the interests of time, and -- and ask De Beers to continue with presentation, I believe hydrology.

PRESENTATION BY DE BEERS CANADA RE HYDROLOGY:

MR. NATHAN SCHMIDT: Nathan Schmidt with Golder Associates, and I'll be addressing the -- the hydrology component of the project.

So starting on slide 50, I just want to give a bit of an outline of the presentation. I'll be starting with a bit of an introduction, talking about the terms of reference, sections of the EIS, and a bit of an overview, then moving into environmental setting, talking about the study areas. There's a bit of overlap with what John Faithful presented this morning, so I'll try to be brief on that.

And from there, getting into the meat of it with the assessment approach and results. We'll be talking, you know, first about the approach, and then by project phase we'll be talking about activities of the project, including the mitigation measures that we're implementing to protect the environment, and then the corresponding effects on -- residual effects on water level and flow, and also effects on channel and bank stability. At the end we'll have a bit of a summary of the results.

So moving onto slide 51, based on the terms of reference, you know, we're really interested in looking at from a hydrological perspective how this affects water quality and fish in Kennady Lake, and also downstream water effects beyond Kennady Lake.

So some of the excerpts from the terms of reference that, you know, guided our assessment are, you know, describing the water balance of Kennady Lake, and provided water balance calculations for present conditions and over time as the project proceeds, and comparing those to baseline conditions.

That allows us to evaluate the changes, and to pass that information down to the water quality team, and to the fisheries team as input into their evaluations.

One (1) of the things that -- that was key here was for the fisheries assessment, you can see in that third sub bullet:

"Include a detailed assessment of

impacts on aquatic life that
considers timing and levels of
increased flows."

So we had to approach this at a fairly fine time scale, and I'll get into how we did that when I get into the approach section.

So on to slide 52, a bit of a summary of what we presented in the EIS. We identified residual effects on flows, water levels, channel and bank stability for water bodies in the Kennady Lake watershed and downstream watersheds. Those effects were used as an asse -- as inputs to the assessment of impacts on water quality in fish, and also on downstream watersheds. And essentially what we found was we don't expect any significant adverse impacts because of the mitigation measures that are applied during the project.

So moving into the environmental setting, you've seen slide 54 there already in John's presentation this morning, but I do want to restress that the area there where the Gahcho Kue project is located is a very small part of the overall Lockhart River basin. They number, it -- it's just over .1 percent. The Kennady Lake watershed is about .1 percent of the total drainage area of the Lockhart

River where it enters Great Slave Lake.

Our local study area -- and for those of you that are there remotely, I'm just kind of circling the -- the tan coloured lobe on the western portion of the -- the watershed map. Our local study area is only about 3 percent. So once we get to the end of our local study area our effects on hydrology are quite small, and a quite small affect on 3 percent of the watershed translates into a much smaller effect on the entire watershed.

Now zooming in a little bit to that local study area on slide 55 -- okay, I apologize. We're missing a slide here, but it is actually a repeat of the -- the local study area that was shown -- was shown in John's presentation this morning, so it can be referenced as the local study area map. And it just provides a little more detail.

The real key point that I wanted to make on that local study area map was that downstream of the site within the local study area we have the -- the flow from the Kennady Lake watershed goes through the 'K', 'L' and 'M' watersheds. The 'N' watershed flows in parallel to that and they meet at Lake 410.

Okay, so some of our water transfers that we're talking about here during de-watering and during refilling of the lake are actually internal to our LSA and, you know, quite a ways upstream of the boundary of our LSA at the Kirk Lake outlet. Okay. And just to be clear, that's slide 17 in the -- the proceeding presentation that describes the local study area.

Now moving on, slide 55, talking a little bit about the environmental setting, we do have quite a bit of site specific local baseline data that have been collected over the years starting in 1996 and going right through to -- to this year. These include climate data, hydrometric data, including flows and water levels, lake bathymetry data. We have stream and lake shoreline geomorphology data. And we also have some ice and winter flow information. So we've tried to get a good understanding of what's happening locally there by collecting data at the site and filling gaps as they're identified.

In addition to this and what you'll see in our baseline report is we've taken the short-term, the relatively short-term data from 1996 to present and combined that with the long-term data from regional Environment Canada and water survey of Canada stations to get a good handle on what we expect our long-term conditions at the site to be from a hydrological perspective.

So a little bit of what we know, ice thicknesses over the course of the winter typically grow to, you know, in the range of 1.8 metres, so we're dealing with fairly thick ice covers and some cases on relatively shallow lakes.

Most of the small lake outlets we've observed to be frozen, so with no outflow during the wintertime in the late season, and though some of the larger ones, such as Lake N -- N11 and Kirk Lake, we have observed flows in the early spring, which leads us to believe that they will flow over the wintertime.

Many of the lake shorelines in the study area are comprised of boulders and exposed bedrock, okay, some of the typical shorelines that we see there. And this is really key to, you know, how we've developed our mitigation measures and what we anticipate the effects to be, in that we're dealing with fairly shallow deposits of material on top of bedrock that are -- are pretty bony. Like there's a lot of heavy boulder and cobble material in there.

The smaller fractions, there's a lot of sand, but not so much in terms of clay and silt that -- that we would expect to be more erodible, or have greater effects on -- on fish if it was mobilized.

In some of the other areas that aren't as rocky, they tend to be the -- the shallower gradient areas where we have the peats and the organic materials that have built up.

When we look at the outlet channels of these lakes that we're dealing with -- and I should -- I should also stress that we're not dealing with long creeks or long rivers or anything in this watershed. Like John said this morning, we've got 35 percent of the landscape that's composed of water. So we've got many, many lakes that are generally connected by fairly short connecting channels.

And you'll see some of the typical channels up on screen right now, on slide 58. For small lakes, where we don't have a lot of flow, what you typically see is a very narrow sort of channel through an organic area.

For -- as the -- the watershed areas increase, what we tend to see is something like you see on the lower right of that slide where you can see quite a rocky bed with fringes of organic material on the banks.

In terms of lake levels and discharges, there's a fairly predictable cycle here that's pretty typical for northern water bodies. We see a -- a rise in lake elevation during spring runoff and tapering off to something that's a little more steady in the late -- late season.

By -- we -- we said this morning that half of the precipitation at the site is due to snowfall. Half of it's due to rainfall. What happens in the -- in the springtime is, your snow melts and you get a large flood peak.

During the late season, we have lake evaporation effects. Those are -- those are significant up here. And some of the rainfall runs off, but some of it goes to evaporation -- evapotranspiration, a gradual release into -- into the subsurface.

So in terms of the baseline reporting in the -- the studies that we've done, we have current work that is still underway. We're doing supplementary surveys. We've completed some supplementary surveys this year on bank and lake shores, and also some additional hydrometry to basically support and to validate the work that we've done to date.

So, you know, we consider that to be good practice, continuing to collect data after the submission of the EIS. And just to be clear, you know, any significant changes that are noted, that need to be

-- in addition to that an operational monitoring program would be expected if the -- if the project proceeds.

So I want to move into the assessment approach here. So we are on slide 62. What we did to, you know, develop our baseline and to pro -- to provide a basis for our impact assessment was to develop a water balance model for, not just Kennady Lake, but the adjacent lakes and downstream to -- to the Kirk Lake outlet. So essentially, we've got the entire LSA covered here.

The model was developed using GoldSim software. That's a -- a publicly available program. It was calibrated and validated using flow and climate data, site specific data from 2004, 2005, and 2007. And what we've done is we've simulated these flows on a daily time step for a period 1959 to 2005.

Why 1959 to 2005? Well, our data set for the climate is based on the available record from the Lupin and Contwoyto stations that are located to the north of the site. They have been adjusted to reflect local site conditions and that adjustment was based on measurements at the site, but what that does, is it provides us -- it provides that linkage between the long-term regional data and the short-term local data that we've collected. So this is a pretty standard approach.

Like I said, the Kennady Lake downstream and adjacent watersheds we've divided those into sub-watersheds. Our model is essentially a -- a cascade of flows from lake to lake to lake. And so another key component of our model is the stage discharge rating curves at the outlet.

So we've incorporated, you know, site specific stage discharge rating curves at the outlet, we've incorporated melting effects of the ice in the springtime and along with, you know, rain and snow runoff, inflow from upstream watersheds, lake evaporation. Okay, so we've -- we've covered off the components of the hydrological cycle here.

What it doesn't include is any significant groundwater inflows or outflows, and we've discussed that with the -- the hydrogeologists and consider that to small relative to the surface water flows that we're -- we're dealing with here.

So once our baseline model was set up, what we did was we superimposed the affects of the project on that baseline model to evaluate hydrologically what our affects would be. So things like, as I say on slide 63 here, diversions of flow, landscape modifications, consumptive water use, we've got all these incorporated into our model. And what that gives us is, for each outlet or water body that we're looking at, it gives us that time series of flow, forty-seven (47) years of data, and it gives us the versatility to extract statistics to -- from that flow record as indicators of what's going on and for comparison purposes.

So I want to get a little bit here into the phases, the project phases that we're looking at, the activities associated with the project, and what our -- what our affects -- a bit of a summary of affects.

We've got a lot of detailed results in the EIS for people to look at, so this is a -- a bit of a look through the keyhole, but we're going to highlight some of the -- some of the ones of interest. Some of this may be a bit of an overlap from the project description presentation, but the format for this, I'm going to show a figure, and then there's some text on the subsequent slides for each of the phases that really describe the same thing, so I may gloss over the text portion of it.

But during construction the major things that we have going on here are de-watering of Kennady

Lake, okay. So we've got water being pumped north to Lake N11. We've got water being pumped east to Area 8. We've got a dike at Area 8 to make sure that we don't have water flowing back. And at this point some of the other features that you'll see there are dams that will be constructed. At some of the tributary lakes we want to reduce the inflow, the runoff into these lakes as we're de -- as we're de-watering Kennady Lake. And so you can see at E-1 here, downstream of Lake D-2 on the west of Kennady Lake at the outlet of B-1 in the north there.

One (1) thing I will mention in the northeast, Lake 3 in the EIS is also designated as a lake that will be, you know, diverted north to the 'N' watershed. There's a -- a design variant that's being looked at right now where we're considering not doing that, okay. Flow would come down from A3 to A2 to A1 and then be pumped over to Lake J1.

And we see that as a -- as a positive effect because we would no longer be diverting water into the 'N' watershed at that point, we would no longer be raising the lake elevation of Lake A3, and we would actually also be supplementing the flows into Area 8, which from a fisheries perspective would be viewed as positive. So I'm not going to, you know, reiterate that in the subsequent phases, but it would be present in those subsequent phases, as well.

So again, we -- as it says on slide 65 there, we did model that. The results are in the -- the EIS and compared to baseline conditions. One (1) of the key sort of results, residual effects that I want to discuss here is shown on slide 66.

And what you can see there is a typical annual hydrograph. This is at the Lake N11 outlet, so this is the receiving lake from the de-watering water of Kennady Lake.

What you can see at the 500,000 cubic metres per day level on the -- the Y-axis there, there's a green line that goes across, and we have the natural hydrograph in -- in red that shows a spring runoff peak, okay, that comes right about to that line.

How that line was established is it's the --the two (2) year natural discharge. So the median discharge from the N11 outlet, and as is typical of these lakes, we get a high flood peak. We have the -- the flows and water levels dropping off rapidly over the course of the open water season. And the effect of the de-watering flows would be to increase the discharge from that outlet, but we never want to go above the two (2) year line. That's the -- the criteria that's been, you know, developed here. We see that as being very protective, and I'll show you some -- for the N11 outlet I'll show you some photographs of it later on, so very protective in terms of erosion of that outlet.

And what you can see there is, we're -- in this case, you know, we're not even approaching that two (2) year level. We're more limited by, you know, the ability to pump water at a high enough rate than we are by that -- that self-imposed limit there that we believe is protective.

Okay. That was slide number 66, and we'll move onto slide number 67 here. The findings for the construction phase. You know, we're expecting that -- at the Kennady Lake watershed, flows are going to increase in Area 8, and that's because of the de-watering activities. But again, we've got that same two (2) year -- natural two (2) year discharge limit that we're imposing there, so we don't anticipate that there will be any -- any adverse effects.

In the downstream watersheds, again in the N11 and moving downstream, we will be increasing the flows after the -- the flood peak there and making sure that we don't exceed the two (2) year discharge.

(BRIEF PAUSE)

MR. NATHAN SCHMIDT: No, that is actually correct, I -- I had a question here on whether...

(BRIEF PAUSE)

MR. NATHAN SCHMIDT: Yeah, no that -- that's correct. Just to clarify, the question there was in that first column on the -- the table on page 60 -- or slide 67, the use of increase and decrease.

What we'll see is that the -- the mean monthly flows and low flows will increase because of the de-watering activities, but the hundred (100) year discharge at the Kennady Lake outlet will actually decrease because it's close circuited, and we won't have a natural peak runoff coming off. If we do get an extreme event in there during that period, it will just be captured, you know, in the lake and pumped at our pumping rates. So that is -- that is correct.

Okay. In terms of channel and bank stability, because we have that -- that protective criteria that's imposed there for the -- the discharge rates, we don't expect downstream erosion to be a problem. We may have sediment resuspension along the exposed shoreline within what is now the water management pond, but that is in the controlled area of the mining project.

I told you I'd show you some -- some photographs for channel and bank stability here. What you see in the photographs on the bottom of slide 69 are some photos of the Lake N11 outlet, and what you can see is large boulder deposits. I mean, this is -- this is very well armoured, and in many cases, many areas we actually have bedrock outcrops across the channel in the -- the left photo, and on the shoreline on the left photo as well.

And so we've done quite a detailed, you know, survey of this area. And, you know, really it -- there's an evaluation in the EIS as well. And erosion at the rates that we're proposing is -- is just not an issue here.

Downstream watersheds, also, you know, quite robust. The -- the other thing I should note is the effects as we move downstream become less reduced because we have natural flows coming in and melding, mixing with these modified flows. And so as we move downstream it becomes less and less of a concern.

Moving on to the operations phase on

slide 70, and this is one (1) snapshot of the operations phase. We will be maintaining that closed circuiting as we move into operations. These lakes on the west side of Kennady Lake where we've put these dams in to divert flows away will begin to fill and spill into the 'N' watershed over there from -- you know, the -- the combination of lakes, D2, D3 and E1 will go into the 'N' watershed. B1 will actually also go into the 'N' watershed and we'll have closed circuiting at the outlet of Kennady Lake.

At that point, we're not going to have any pumping into Area 8, so we'll expect flows to be reduced in that area. And there may be pumping during some years still from the water management pond into Lake N11, subject to water quality restrictions.

So slide 71 kind of merely reiterates what I just said but in text just for your reference. And again, we did model these as a snapshot to -- to reflect those conditions and compare them to baseline conditions.

So a summary of those findings is on page -- or slide 73. And so what you'll see in the Kennady Lake watershed is, you know, outflows to Area 8 will be reduced. We have that diversion of the -- the western lakes into the 'N' watershed.

The actual water yield from those lakes will be reduced a little bit from what baseline is simply because we've got more surface area and more potential for lake evaporation. The D2, D3 lakes, in particular, will take a few years to fill up, so we won't see this in the early years of operations. But at a certain point they will spill in the downstream watersheds, you know, similar but -- but reduced from what we would see during de-watering over on the -- the 'N' watershed side because we won't be pumping it as at large rates. And in years when there is no pumping it'll be pretty similar to baseline conditions except for what's being received from those western diversion lakes.

Channel and bank stability, I did want to talk a little bit about the diversion flows going from those western lakes into the 'N' watershed. These -- these lakes are expected -- some of them will be just ephemeral. We'll have -- and this is what we see in the -- in the natural situation, is we get flow during springtime. But if the watersheds are small enough in the late season they cease to discharge just because it's so evaporation dominated and we don't have enough rainfall to -- to compensate for the amount of evaporative loss.

You can see a typical hydrograph there which looks a little bit like the one we saw from Lake N11 except for the fact that in the late season, yeah, we do go down to a zero discharge. In concert with -- on the -- the upper part of that graph you can see the precipitation that's occurring during those periods, and so you can see small spikes in the -- in the hydrograph due to local precipitation.

And looking at some of the -- the existing outlet channels, I mean, these give us an indication of what the diversion channels, you know, could look like for the -- the corresponding drainage areas, so, you know, through the organics, very small channels, low erosion potential. For some of the larger ones we do have again kind of the rocky beds that would be exposed during the late season, so.

That was slide 76 that we just discussed there.

And another, you know, typical of a -- a larger channel in the area. Really, this is -- this is a consequence of the surficial geology in the area. In those areas that are vegetated, if you stripped off that vegetation and got rid of the fines this is what's lying underneath. It's in most areas. It's quite rocky. And so that's another factor to consider when we talk about the shoreline erosion that's coming up.

Moving to slide number 78 now. Just to elaborate a little bit on the baseline study that has been ongoing. In 2010, we started a program to look at lake shorelines, to deal with potential effects of raising these lakes in the -- the western diversion area, in particular. And we also did look at the A3 lake.

So we collected information such as, you know, slope gradients, what types of materials are present along those shorelines. There's also some work going on in terms of ways exp -- wave exposure. And I've brought in one (1) of my colleagues on this, who is actually a coastal geomorphologist that, you know, gives me a lot of comfort in the results that are presented in the EIS.

So what you'll see in the EIS is that it's a -- it's a qualitative assessment, but there is more quantitative work that's being done right now based on this data that we've collected in 2010 and 2011.

Channel -- or slide 79. You know -- again, some typical shorelines in the area. And what you can see, even in the overbank areas along the shore, we've got exposed boulders, that sort of thing.

You know -- we see, you know, heavy materials in here. Also thin -- relatively thin layers of surficial soils. And so that gives us a lot of comfort in the assessment.

So, in summary, during the operations phase, slide number 80, here. I -- looking at the Kennady Lake watershed, you know, we do expect that the raised lakes will have new shorelines forming over time as -- as things stabilize. But what we also expect is that the quantity of fines in those existing mat -- in those exiting shor -- or the -- the future shoreline areas is small. It's very bony material. It will armour up quite rapidly. And the fines that are in there aren't things like clays that refuse to settle out. They're things like sands that settle out very rapidly and would expect to settle out quite locally to those new shorelines.

Downstream watershed 9 -- I mean, things are quite stable here during operations, so we don't expect any -- any significant effects on channel or bank stability in the 'N' watershed or indeed downstream.

Moving on to the closure phase. And closure to me means refilling. Okay, this is when Kennady Lake gets its water back. And what you can see on the -- the photo. Or the plan, on -- on slide 81, is where that water's going to come from.

We'll still have close circuiting at the upstream of area 8, but we will have those reconnection of the diversion lakes. So we'll have the -- the existing watershed of Kennady Lake contributing. We'll reconnect the areas that were diverted away. And we're also looking to refill the lake sooner. What we want to do is pump water from Lake N11.

So, as with every snapshot here, what we've done is modelled that according to the -- the activities that are present in the project description. So that's summarized on slide 80 -- 82.

And, just an illustration of what we're dealing with here on slide 83. This is another representation of, you know, what's going on with the hydrology of Lake N11 during closure. And -- so you can see another green line. That's our self-imposed protective criteria for how much water we can take out of that lake in any given year.

And what we're seeing is -- we want to make sure that the flows at -- at the Lake N11 outlet don't go -- go below the one (1) in five (5) year dry condition. So we're not going to, you know, pump so much water out of the lake that the outlet dries up and

-- and there are downstream effects. We're going to go with something that's well within the range of natural variability. And the excess water is what will be siphoned off, pumped off to use to -- to refill the lake.

So on slide 84, again, we have kind of a text summary of that -- that modelling -- the modelling results. And what you can see for the Kennady Lake watershed, the effect of diverting that water, pumping that water in from Lake N11 would be to reduce the refilling time from around seventeen (17) years down to about eight (8) or nine (9). So it's going to bring the -- the system back more rapidly, restoration of the 'B', 'D', and 'E' watersheds, those operational diversions.

And what we will still have is a -- a reduction in flow at Area 8 because we still have that close circuiting upstream of Area 8, so it's not receiving the -- the Kennady Lake flows during closure period. In the downstream watershed, you know, the -- the primary area of effects is at Lake N11 and downstream. And like we've said we're -- we're attempting to be very protective of the environment with our -- our approach there.

On to slide 85. And what we want to do

is restore the existing flow and water level regimes in those diversion lakes. So that's our -- our primary focus during closure in the Kennady Lake watershed. And in slide 86, again we have a text summary of that for people to reference.

Now moving on in slide 87 to the post-closure phase. And post closure, you know, represents our -- our long-term, kind of, walk-away period. And what we see there -- and this is for the case that's -- that's presented in the EIS, is the primary effect that we see is the -- a change in land to lake ratios. And so, I talked before about how important the evaporation during the summer, how important those effects are on the flow regimes.

And so what actually happens here is we have less lake and more land. What that does is it increases the -- the runoff to the lake and it reduces the evaporative potential. So we actually would see flows increasing a little bit. The -- the flow regime increasing a little bit in the post-closure scenario. So a little more water, not a lot, okay.

The other change there is we'll be changing, because of that encroachment in the lake, changing the area elevation/volume relationships of Kennady Lake and so there will be a little less attenuation during floods. And so the floods would come up a little bit, but you know, we're talking less than 10 percent, it's not a significant change.

Again, in -- in slide 88, you know, we -- we talk about what I've just -- just discussed in the context of the -- the figure.

And on slide on 89, you know, a few -- a few numbers in the summary. We're looking at a 8.9 percent increase in Kennady Lake mean annual water yield. You know, that would change somewhat based on some design variance, but not significantly. And I think it -- it would -- if we -- if we keep that 'A' lake -- 'A' watershed intact with that design variant it actually reduces the -- the overall effect here.

So modest permanent changes to the flow regime at the Kennady Lake outlet. A continual theme here is that any changes at the outlet get reduced as we move downstream. We've got more natural water coming in and mixing with our water that we've changed the -- the flow regimes on.

So as you move downstream to the outlet of the LSA changes will become small. Once again, that's only 3 percent of the -- the area at the mouth of the Lockhart River. And so there will be no, you know, measurable effect there during any of these phases at the -- at the Lockhart.

So just to bring it to and end here, I've got a couple of slides with a summary of the assessment findings. Short-term effects, and by short term we're talking construction, operations, closure period. Water management activities, you know, are intended to allow the mine development while being protective of the environment. I've discussed, you know, a number of mitigation measures, limits, that we are imposing here just to make sure we don't have any adverse effects related to hydrology.

Dewatering and refilling. You know, certainly those are the -- the biggest water transfers that we're going to see during this project, and those will affect the magnitude and the variability of -- of flows and water levels downstream, but like I said, we've -- we think those are fully mitigated.

And I think the other major thing that we're concerned about is the shoreline erosion, but we have collected a lot of, you know, site-specific data. Everything that we've seen from the site-specific data we've collected this year is -- is consistent and supports the conclusions that are in the EIS.

The EIS was -- was mainly a desktop qualitative assessment, but what we've seen so far from the quantitative data collection supports what we said, and we're going to take that a step further and, you know, do a more detailed analysis on it once all those -- the field data are available.

Okay. And I've -- I've just been passed a note here that I -- I can say that we expect the new information to be delivered in the first quarter of 2012, so you know, that analysis is already under way, and it's -- we don't see any roadblocks to, you know, putting it in front of the Board.

In terms of long-term effects, you know, we expect them to be smaller in general than the short-term effects. We're reconnecting our systems. The biggest effect is, like I said, the changes in the balance to -- of lake and land area within the Kennady Lake watershed. Effects less than 10 percent are what we're expecting there.

And those -- on that scale, those aren't expected to have any long-term geomorph -- geomorphological changes downstream, especially with the kind of channels that we -- we see in this area, and the kind of shorelines that we see in this area.

And that pretty much brings me to the end of my presentation, so thank you for your attention. Appreciate it.

THE FACILITATOR HUBERT: Chuck Hubert with the Review Board. Thanks very much for that presentation. And we find ourselves close to lunch here, so I -- even though I know there are likely questions from participants, I think we'll let you all ponder the information presented and ask these questions after lunch.

So with that, I think we can dismiss ourselves until returning at 1:15. See you then.

MS. VERONICA CHISHOLM: Chuck, I -- Veronica Chisholm from De Beers. I just have a quick question to Velma Sterenberg, I hope I pronounced that correctly, to see whether we -- we did answer your questions through the presentation. I'm wondering if -- if we -- if we've managed to cover that off.

MS. VELMA STERENBERG: Velma Sterenberg, AANDC. Yes, you've -- you've raised another question, but I think it would be better if I just talked to John directly about that, because it's quite detailed and I don't think -- I think it falls outside the scope of -- of the -- what's going on here at the hearing.

And your colleague there had suggested he might provide me with one of SRK's reports that'll have the information -- the rest of the information I'm looking for. Thank you.

MS. VERONICA CHISHOLM: Thank you.

THE FACILITATOR HUBERT: Okay, once again, 1:15. See you then.

--- Upon recessing at 11:58 a.m.
--- Upon resuming at 1:18 p.m.

THE FACILITATOR HUBERT: Good afternoon and welcome back, everybody, to the Gahcho Kue GAP (phonetic) analysis session. It's not a GAP analysis session, actually. Dur -- this morning we had a few follow-up items that De Beers was going to provide some information on. Are you ready to respond to those?

MS. VERONICA CHISHOLM: Veronica Chisholm, from De Beers. Yes, we're ready to respond. There's just actually one (1) because Velma indicated that our presentation addressed her questions. So we just have the one (1) question from Steve Ellis. And John Faithful will respond to that.

MR. ALAN EHRLICH: Looking around the room, I don't actually see Steve. It's Alan Ehrlich. I don't see Steve Ellis here right now. If you're going to respond to him it's probably better -- but was the question Todd Slack's or...? Sorry, I'm just getting a little bit of confusion from our team over here.

If it's a question for Steve I'd rather wait a few minutes until he's here to that De Beers doesn't need to repeat itself to -- you know, to settle the discussion. Is there another subject that came up that you have information on?

MS. VERONICA CHISHOLM: I think we have addressed all of the questions from the morning session. But I do have -- earlier I had asked for clarification from Todd Slack, from the Yellowknives Dene First Nations, on a question regarding the persistent organic pollutants and the dioxin/furans.

MR. ALAN EHRLICH: Todd, are you ready to give that clarification now?

MR. TODD SLACK: Todd Slack, Yellowknives Dene First Nation. I'm ready to give it a try anyhow. The -- excuse me. The intent behind the -- the question was twofold. One (1), to establish that there was going to be some type of emissions guidelines, which the -- the Company has indicated that there would be, but number 2, to also ensure that there's some sort of baseline collection to allow parties at a later date if the emissions plan has exceedances, as we've seen at all of the mines thus far, to allow us to go back and evaluate effects from the mine. If we don't understand where the starting point is we won't be able to understand what the contribution of the mine will be.

Does that clarify the intent?

MS. VERONICA CHISHOLM: Veronica Chisholm, form De Beers. Just one (1) more clarification question. Thank you, Todd. Were you looking for -- in terms of baseline sampling you're -- are you looking for air or soil samples or do you have a particular parameter you would like us to measure?

MR. TODD SLACK: Todd Slack, Yellowknives Dene. Well, I -- I'm not looking to dictate the -- the nature of this. The -- the key is the receiving environment. So, to my mind, this would be sediments. This is consistent, as far as I know, with the -- the work that Anne Gunn and EC did up at the other mi -- mine sites.

And so there is precedent for this. We -- this is not asking for something new. Over the years we've seen a -- troubles with all the incinerators, but we have no starting point to try and evaluate what the impacts were.

However you want to develop your sampling and, you know, and part of your aquatic effects monitoring program at a later date to evaluate this is fine by us as long as there's a commitment to do this type of work before the mine is in place, because once it's there we're never going to know.

(BRIEF PAUSE)

MR. STEPHEN LINES: Todd, well, Veronica discusses -- Stephen Lines, from De Beers. I just wanted to clarify the work you mentioned. Was it Anne Wilson of Environment Canada that did the work, or -- you mentioned Anne Gunn.

MR. TODD SLACK: Oh. Todd Slack, Yellowknives Dene. Yeah, pardon my misspeak there, my error. You're quite correct.

MR. STEPHEN LINES: Thank you.

MS. VERONICA CHISHOLM: Veronica Chisholm, from De Beers. Yes, Todd, we are developing aquatics monitoring framework and a monitoring program, and we will evaluate the parameters that we will measure, and that will be done in advance of construction.

MR. TODD SLACK: Todd Slack, Yellowknives Dene. Can I ask one (1) point of clarification there, and is the intent to have persistent organic pollutants as part of this monitoring program? Th -- that's the commitment that I'm looking for.

(BRIEF PAUSE)

MR. STEPHEN LINES: Hi, Todd, it's Stephen Lines, for De Beers. I think at the last meeting De Beers had back at the end of October we had mentioned to all the communities that one (1) of the things that De Beers is going to be undertaking early next year is getting out to the communities and talking to them.

One (1) of the specific purposes of those engagement activities is to discuss what the communities would like to see in the -- the monitoring plan. So I think Veronica has mentioned that De Beers would be doing monitoring of some kind in relation to this. But the specifics, I think, it might be helpful if we had a specific discussion over what should be included in those with the communities. So maybe this is something that we can follow up on, specifically with the Yellowknives Dene at that time. I don't know if that's helpful to you. Thank you.

MR. TODD SLACK: Todd Slack,

Yellowknives Dene. We're -- you know, we're at an information gap session. Here's an information gap, the other mines, we can't do this, because they're already built, the impacts are there.

Your mine is to come and it's not going to do us any good to not evaluate this in a baseline. I'm telling you that here you have this gap, you guys can take that away, but we're going to, you know, it -- you don't even have to come to the community for this one. We're telling you right now. Yeah, I'm -- I'm -- I'm just -- I'm a little unclear as to sort of what we're trying to achieve here then.

THE FACILITATOR HUBERT: Chuck Hubert, Review Board. We're trying to achieve, Todd, exactly what you're expressing, and that is if parties have gaps perceived they -- those should be expressed dur -- to De Beers. The Review Board notes them and if a commitment cannot be made then the recourse for a party such as yourself is an Information Request.

MR. STEPHEN LINES: Thanks, Chuck. Thanks, Todd, for the comment. I guess just to follow up, I would, you know, note that the development of the monitoring plan, this is an ongoing process as De Beers learns feedback from communities and all parties throughout the -- the process. And Veronica had mentioned that this is something that we're going to be looking at, and it's just the details of, I guess, what to monitor, when that needs to be worked out. So as I said, we'll look to get more input on that in the very near future from the communities.

QUESTION PERIOD:

THE FACILITATOR HUBERT: Chuck Hubert with the Review Board. Thanks very much for that response.

I'd like to continue now. We ended this -- this morning with a presentation on hydrology, and I -- I would like to take about ten (10) minutes to -- to address a few questions on that -- on that topic. And I'd like to start out with two (2) questions from the Review Board's technical advisor, Doug Ramsey, of Tetratec. So his question is as follows:

"For lakes and streams that will experience higher water levels than at baseline, what is the increase in area for each water body, both in total area and as a percentage of the existing water surface area, and how long will these increases persist?"

(BRIEF PAUSE)

THE FACILITATOR HUBERT: Chuck Hubert with the Review Board. Just a note to parties remote, De Beers is caucusing at the moment, and will respond when -- in due course. Thanks.

(BRIEF PAUSE)

MR. NATHAN SCHMIDT: Nathan Schmidt with Golder. And the question, as I understand it, has to do with the -- in -- in the areas where we have stream diversions and pumped diversions, what are the changes to the -- the total watershed areas and the balances of -- of lake areas and land areas.

There are two (2) different cases that we're looking at here. One (1) is where we're diverting a watershed in the -- and that's the case of the, in the current EIS, the 'A' watershed, as well as the -- the 'B', 'D', and 'E' watersheds.

So it's -- it's possible to extract those numbers out of the EIS. If you need us to follow up on that, we can -- we can do that. The -- the watershed areas and the lake areas are all in -- in the EIS. They haven't been added up, to answer your question, but if you need us to do that, we can do that. For the case of the pumped diversions, it -- it's not a case of an addition to a watershed area, it's a -- an addition of a quantity of flow at a certain rate.

And so we can't really answer that question in that instance, but, like I said this morning, we have some very protective criteria for limiting those discharge rates that we have a -- quite a high degree of confidence in.

I'll -- I'll leave it at that, and...

THE FACILITATOR HUBERT: Chuck Hubert with the Review Board. Thanks for that response. I believe that, as you've stated, if the hectarage, or acreage, of -- of expanded lakes is in fact in the EIS, then -- then we can locate that. How about streams, however? As opposed to -- to lakes?

MR. NATHAN SCHMIDT: Can you clarify the question again, please?

THE FACILITATOR HUBERT: Yeah, the -- the question -- to reiterate, it -- it was for lakes and streams that will experience higher water levels than -- than at baseline.

What is the increase in the -- in the water body size? So, not -- not simply lakes, but interconnecting streams as well? In total area?

MR. NATHAN SCHMIDT: Okay. Typically what we would provide is the -- the increase in size at the lake outlet. And because we're in a situation where the -- the connecting streams are so short, any additional watershed area contributing directly to the stream, rather than to the upstream watershed, would be negligible. So the -- the answer is essentially the same. Like, for the N17 outlet, and the N17 channel, the numbers would be identical.

THE FACILITATOR HUBERT: Thank you very much. Chuck Hubert, Review Board. Thanks for that response. And the latter part of the question was, how long will the increases in -- in extended lake or -- or water body boundaries persist?

(BRIEF PAUSE)

MR. NATHAN SCHMIDT: Nathan Schmidt with Golder. Now again, we have the -- the two (2) different types of activities. We've got the -- the diversion of a watershed and then we've got the pumped diversion during de-watering. So I'll address it on a -- a kind of a water body by water body basis here.

During construction, the de-watering

activities -- we will have the elevated flows at the Area 8 outlet for one (1) year. And at the N11 outlet for two (2) years. At the N11 outlet for three (3) or four (4) years of operations, we expect some elevated discharges as well, though at a lower rate or a lower volume than during de-watering. So that covers off the -- the de-watering activities in the pumped diversions.

On the other side of it we have the watershed diversions, where we're raising those -- the 'D' and 'E' lakes, and we're diverting the 'B' lake. As I mentioned this morning, there will be some filling times for the 'D' lakes. 'B' lake is expected to -- the diversion take place immediately, as soon as we, you know, construct that dam and the diversion. So there'd be a duration there of approximately eleven (11) years during the mine life.

The 'E' lake, it has to rise up a little bit, but we do expect that to happen in the first year. And so again, for the 'E' lake there would be an eleven (11) year duration. And for the 'D2', 'D3' lakes it does take a little bit longer for that to fill -- about three (3) years to fill. And so we'd be looking at eight (8) years duration for the -- for the diversion.

(BRIEF PAUSE)

THE FACILITATOR HUBERT: Chuck Hubert, with the Review Board. Thanks very much for that -- what I think was a comprehensive answer. But I'll -- I -- I believe it's a comprehensive answer on behalf of Doug Ramsey, who -- who will respond either way. So thanks.

One (1) -- one (1) further question from Doug Ramsey that relates to climate change. And this is verbatim from -- from Doug.

"How have the potential expected effects of climate change have been incorporated into the hydrologic model both for the hundred-year predictions as well as the fifteen thousand (15,000) year predictions?"

MR. ALAN EHRLICH: If it -- if it's any help at all, when I saw the question about fifteen thousand (15,000) years I went, What? And wrote back and said, Fifteen thousand (15,000)? And Doug Ramsey pointed out that the -- one (1) of your slides you do extrapolate to the fifteen thousand (15,000) year point. And I wasn't here for the morning, so I don't know which slide it is, but it sounds like that's where that number came from.

(BRIEF PAUSE)

MR. NATHAN SCHMIDT: Nathan Schmidt with Golder. First of all, I think we know the source of the fifteen thousand (15,000) year -- and that's from the hydrodynamic model that's part of the water quality assessment. So if we could potentially defer that question to the questions for the water quality. It -- it was not -- that sort of time frame wasn't factored into the -- the hydrology component at all.

The short answer for the climate change is we did not consider it in the hydrology section, it's dealt with in "subject of note" on climate change which is Section 11.13 in Volume 6B. It's discarded there as a secondary pathway because we don't see significant effects over the time frame of the project.

Basically the projections of changes to precipitation, in which there's a great deal of inherent uncertainty, really only indicate precipitation increases on the order of 10 percent. When you translate precipitation into runoff, other things that you need to factor in are things like lake evaporation. I spoke about that this morning, and what it says in the subject of note there, and which I agree with, is they don't know what's going to happen necessarily with lake evaporation in terms of increase or decrease.

The lakes themselves are attenuators of flow, so it decreases the sensitivity, the fact that we have this whole chain of lakes. So the endpoint of all this is, you know, will climate change change flows and water levels and from thereon bank stability -- shoreline stability? And we think we're in a very robust -- like, we've got confidence that we're in a -- a fairly robust system with the amount of rock there, with the lake attenuation, that -- and the short time frame of the project and the minimal changes at closure that we don't think it's a concern. We -- we believe that.

THE FACILITATOR HUBERT: Chuck Hubert, with the Review Board. Thanks very much for that response. I'd like to now open it up to other participants who were here for the hydrology presentation this morning. A question or two (2) would -- from anybody, now is the time.

MR. JULIAN KANIGAN: Thanks. It's Julian Kanigan from Aboriginal Affairs. So, as John mentioned this morning, AANDC and -- and De Beers have had a bit of a back and forth with our consultant giving some comments, and then Golder giving some responses back. And so this is in regards to one (1) of those responses and just getting some clarification.

And so one (1) of the things that we heard -- heard Nathan mention today is that in terms of sediments, the -- it's mostly cobbles and coarser sediments at the margins of the lakes, particularly Kennady Lake. And one (1) of the things that our consultant noted was that over half of the lake area of -- the Kennady Lake area, according to the EIS, actually consists of finer sediments, so he calls them fine flocculated sediments, at deeper -- at levels deeper than 4 metres.

And so I -- I guess I'm looking for some clarification now as to whether you think tho -- those are significant or not. And the reason that I'm asking for -- for those that are maybe not so familiar with the water quality issue -- when de-watering occurs, if those finer sediments were stirred up they could cause consequences to fish, could have consequences for fish habitat. And I think they could also impact nitrogen and phosphorus levels, so potentially leading to algal bloom. So that -- that's the reason we're asking.

(BRIEF PAUSE)

MR. ALAN EHRLICH: While De Beers is caucusing and considering its response to Mr. Kanigan's questions, we've just received an email saying that the webcast appears to be temporarily down. I'm just going to remind everyone we said we're going to continue on briefly with the session despite any technological hiccups we might have.

But if you can -- some of the quiet times you have are going to be because people are considering their answers or considering their questions, so don't despair. That last pause was De Beers trying to figure out how to best reply to the question.

Anyway, if -- we are having technical problems with our international webcast we will certainly -- we've got someone looking into this right now and we hope to get things working soon.

(BRIEF PAUSE)

MR. ALAN EHRLICH: What I'm told by our sound technician is that sometimes if it cuts out it's going to be an issue regarding the person who's receiving its computer, and it sounds like our system is still working. I'm going to ask any of the Board's technical advisors to send an email to Chuck to indicate if you can hear me right now, but just because we want to know if people in other places are still able to participate.

Meanwhile, De Beers continues its caucus on the subject.

(BRIEF PAUSE)

MR. ALAN EHRLICH: While we're waiting for a response from De Beers, I'm going to ask everyone who's here, if you have not signed the sign-in sheet, please sign the sign-in sheet. It's at the table by the door. Thank you. Wendy Warnock our transcriptionst emphasizes you should not just sign it, you should sign it in a clear and intelligible manner, it's legible, because she needs to be able to read it for the purposes of the transcript. Thank you.

(BRIEF PAUSE)

MR. JOHN FAITHFUL: John Faithful, Golder Associates. Thanks, Julian. The objective of the water management plan in the construction period is to de-water the -- the lake, Kennady Lake to the -- to the maximum extent possible. It will -- that will accompany the diversions of the upper watersheds and the diking of areas -- area -- between Area 7 and Area 8 to control -- to develop the control area to -- to isolate the Areas 2 to 7.

The de-watering of Kennady Lake to either Area 8 in the first year, or to Lake N11 for the subsequent two (2) years is going to result in draw-down. At some point the draw-down will get to a point where there is likely to be some exposure of the final -- at the deeper lake bed sediments that will result in turbidity. In order for the -- for discharge to continue there will -- there will most likely be some water quality discharge criteria that will be more likely set with -- with total suspended solid concentrations, and possibly even other parameters such as -- as nutrients, nitrogen, and phosphorus.

Prior to and during the de-watering process there will be a fish salvage and the -- as a result of the de-watering, the Areas 3 and 5 will be deemed habitat unsuitable for fish. Water that doesn't meet discharge criteria will not be pumped to Lake N11 and to Area 8.

Does that provide your answer?

(BRIEF PAUSE)

THE FACILITATOR HUBERT: Chuck Hubert, Review Board. Thanks very much for that response.

Further questions? We'll take one (1) more, because we do have to move onto geochemistry.

MS. CORRINE GIBSON: Corrine Gibson with DFO. Two (2) questions, one is quick. The first one relates to groundwater contributions in the streams draining Area 8. And you mentioned that you haven't quantified how much groundwater is contributing to the water balance.

Do you have an indication as to whether or not those streams are gaining, losing, or in potential locations of groundwater upwelling? Corrine Gibson, DFO.

(BRIEF PAUSE)

MR. DON CHORLEY: Yes, this is Don Chorley. There's a -- there's no taliks underneath those rivers and creeks, so the contribution to base flow from that would only be from the active layer.

And right now we think the active layer is only in the summer, so I don't know if -- it would not be that much compared to the -- the flow from surface water just from precipitation and runoff. Thank you.

MS. CORRINE GIBSON: The other question would then relate to the pumping rates, as well as to the potential supplementary inputs that you'll be putting into the downstreams, both in the stream down of Area 8 as well as through the N11 watershed.

And you mentioned that you've picked levels that are protective for erosion, and I'm wondering what considerations you've given to be protective towards fish and preventing -- and minimizing impacts to fishes spawning, rearing, and their various life stages.

(BRIEF PAUSE)

MR. ALAN EHRLICH: Our apologies to our remote participants. We lost the webcast for somewhere between five (5) and ten (10) minutes, but our understanding is it's back on, and our -- our sound technician has solved and -- and fixed the problem.

You'll have to have a look at the transcript to see what happened in the last five (5) or ten (10) minutes. De Beers is now preparing a response to the Department of Fisheries and Oceans.

(BRIEF PAUSE)

MS. VERONICA CHISHOLM: Veronica Chisholm from De Beers. Thanks, Corrine. Appreciate the question. We will respond to the pumping rate one, and with respect to the fish we do have the fish presentation coming up, and we would like to respond to that as part of that presen -- fish habitat presentation, if that's okay. So, Nathan...?

MR. NATHAN SCHMIDT: Okay. Nathan Schmidt from Golder. With regards to the discharge of pumped water into Area 8, a couple other features that we're incorporating including not exceeding that -- that median freshet discharge. So we're not going to be, you know, piling extra water on top of flood flows, that sort of thing. So that helps with not just erosion but with, you know, fish passage, that sort of thing.

The other part of it is there's an element of ramping up and ramping down, so fish will have time to respond to changing conditions rather than having just a rapid step change in inflows and water levels to prevent any stranding sort of incidents.

MS. CORRINE GIBSON: Corrine Gibson, DFO, to follow up. My concern comes to -- for the most part with respect to grayling spawning, and they spawn with peak freshet. And that's an indicator cue as to when they go to spawn, as well as, as water levels drop off it's an indicator cue for changing temperatures, as well, for fish to migrate downstream. And you don't have to give an answer now, but just -- it would be nice if you could present some sort of thought that you've given and how you're going to be con -- taking these into consideration in ensuring that you're not disrupting the natural hydrograph, seasonal hydrograph, daily hydrograph rates. So that you aren't disrupting the fish cues.

MR. NATHAN SCHMIDT: Thank you for the -- the comment and we'll make sure that that's addressed during the fisheries presentation. Nathan Schmidt, Golder.

THE FACILITATOR HUBERT: Chuck Hubert, Review Board. Thanks very much and we look forward to -- to the fisheries portion of the aquatics presentation later on. And there may be some questions about -- about the whole ramping issue as well. So, just to -- to let you know that that may -- may occur as well.

But I'd like to now continue with the De Beers presentation. Thanks I'd like to continue with the De Beers presentation on geochemistry now, and so if we can proceed with that, that would be great. Thanks.

PRESENTATION BY DE BEERS RE GEOCHEMISTRY:

MR. KEN DE VOS: My name is Ken De Vos. I'm a geochemist with Golder Associates. I have about twenty (20) years of experience evaluating geochemistry for mine sites around the world. And I've spent a significant portion of the last twelve (12) years of my life evaluating geochemistry for mine sites in the Northwest Territories.

I'm going to talk to you today about geochemistry. In particular, the geochemistry of the Gahcho Kue project. I believe we're starting out the geochemistry presentation on slide number 93. I'm going to flip down immediately to slide number 94. And slide 94 gives an overview of what I'll be talking about.

I'm going to provide a brief discussion on the objectives of a typical geochemistry program. And I'm going to follow this with a discussion of the methods that we're going -- that we've used, the program completed for the Gahcho Kue project, the results, and the supplemental evaluations completed.

The results to date for the Gahcho Kue project, geochemistry, show that most of the mine rock and all of the PK, or processed kimberlite, is non-acid generating, with low potential for metal leaching. The leach test results are used in the water quality assessment and sub -- some supplemental data was collected, in particularly -- or sorry, in particular, as related to phosphorous.

I'd like to note here that there's a very large body of detailed information available regarding the geochemistry for this project and I encourage everyone who's interested to read Appendix 8.2 of the environmental impact statement, where all of that data is presented.

Moving to slide 95. There are a couple of primary objectives related to a geochemical test program and analysis program. One (1) of these objectives is understanding the influencing factors that control the water quality. These factors include rock-water interactions. Rock-water interactions are simply what happens to the chemistry of the water as the -- the water -- when it encounters rock from the site. And particularly, blasted rock or rock that's moved around the site.

We also want to understand the interactions with the atmosphere, which are the changes that could take place when this rock is exposed to weathering. There are also then chemical reactions that could alter the water chemistry as it moves through the different rocks and water pathways. So we want to understand that as well.

The other main objective of developing this geochemical understanding is so that we can develop appropriate design and mitigation measures for the mine rock and the processed kimberlite. And that's going to help us to protect the environment.

Aspects of the geochemistry program that help us in the design decisions include understanding what inputs are appropriate for the water quality estimates and understanding what different mitigation option -- options can do to help change the chemistry of the water coming from the site.

Slide 96. When we assess the geochemistry for a project such as Gahcho Kue we use a number of publicly available documents for guidance. These documents are fairly widely accepted -- they are widely accepted and they're listed on the slide. They include a guideline for acid rock prediction in the north as published by DIAND in 1992, there's BC guidelines for prediction of metal leaching and acid rock drainage published in 1997, and there's more recent guidelines published by MEND in 2009, and there's also the Global Acid Rock Drainage guide -- guideline published in 2009. And the GARD Guide, or the Global Acid Rock Drainage Guideline is available on the website as shown on the -- on the slide. And again, I encourage anyone interested in understanding the test methods and rationale for the geochemistry to refer to those documents. I enjoy reading them and I'm sure you will too.

Slide 97. I'm going to speak briefly now about the test program considerations for the testing completed on the Gahcho Kue site. The first consideration in the design of a geochemistry program is selection of appropriate and representative samples. To select these samples we consider the geological distribution of the materials, we consider the mine plan, the tonnage of rock to be excavated, the rock types or lithology of the rocks to be excavated as well.

We look at ore processing, the types of processing that are going to take place, and the types of waste materials such as processed kimberlite that are produced. And then based on all of this information we select a set of samples that we consider to reasonably represent the rock to be excavated and processed.

Following the sample selection we complete a laboratory testing program on the samples which consists of what we call static testing and kinetic testing. Static tests are typically one (1) time tests or -- or are completed over a short period of time, and they provide the information -- information about a specific sample.

Types of tests include acid base accounting or ABA elemental analysis, mineralogy, and short-term leach testing. Acid base accounting provides a measure of the balance between the acid-forming minerals such as sulphate and the buffering minerals such as carbonate or aluminum silicates. An example of a sulphide mineral that could produce acidity would be pyrite.

We -- they also do chemical or elemental analysis. And this analysis provides and indication of the overall elemental makeup of the rock or the chemistry of the rock.

Mineralogy is completed and that provides an indication of how those elements or chemicals are put together in the rock, or the types of minerals in the rock. And that gives us a good indication of how those -- those -- those rocks are going to react understanding what the mineralogy is.

In short-term leach testing, which is also a static test, we typically take a rock sample and we'll grind it or pulverize it, mix it with distilled water typically, and then the water is analyzed -- filtered and analyzed to look for chemical changes that occur when you in -- the rock interacts with the water.

Kinetic tests are often carried out on a smaller subset of samples. And these are simply repetitive leach tests where you take the same sample, and we add water on a regular cycle, typically a weekly cycle, and the water that interacts with the rock on that weekly cycle is then analyzed for the chemistry. And that helps us determine whether the chemistry is going to change over time with interaction with those rock samples.

There are several different types of humidity cell tests -- or sorry, kinetic tests, including humidity cell tests, columns, submerged columns. And I'm going to describe some of those in the next few slides.

Also I'd like to note that a typical

test program uses a staged approach. In a staged approach we look at the results of the initial set of analyses, use that information to help us focus on what other parameters or analysis we might have to look at in more detail to get a better understanding of their behaviour.

And an example of this staged approach for this particular project is the development of our test program in our understanding of phosphorus, which I am also going to talk about a little bit later.

Slide 98. This slide shows a photograph -- this slide shows a photograph of a typical humidity cell. Material in the humidity cell is subject to wet and dry cycles. Water is added to the top once per week. The water is allowed to drain through the sample. Then it's collected and analysed at the base of the sample for a comprehensive suite of chemical analysis.

And the duration of these -- these tests or the number of cycles is typically about twenty (20) weeks, but oftentimes that's extended longer in order for us to get a better understanding of longer term behaviour of these materials and the types of changes that the rock may encounter as it weathers.

We're on to slide 99. This is a

different type of kinetic test. This is a typical saturated column test. So in the previous slide we showed what would happen if -- on a series of wet and dry cycles, and these particular tests, they're similar to humidity cells in that water is added and analysed once per week. However, the cells remain saturated for the entire week, and this gives us a better indication of what might happen in a submerged environment.

Again -- well, the other thing that we do with these tests is we collect water from both the top and the bottom of the cell so we understand what might happen on either side, either above the materials or as water filters through these -- these solids.

Again, the test duration is typically about twenty (20) weeks, but, you know, we also extend some of these tests longer to predict long-ter -- longer term behaviours.

Slide 100. So I spoke briefly about the types of tests that we conduct. This table is provided to give an indication of the number of tests performed for the Gahcho Kue project. For static testing on solids I'm going to round some numbers here.

We can -- tested over six hundred and fifty (650) samples of kimberlite and process kimberlite. We tested over twelve hundred (1,200) samples of mine rock. And this is far above the suggested minimum number of samples to be re -- required by most of the guideline -- well, by all of the guideline documents referenced earlier.

Now from these main static tests of solids, these are primarily ABA tests, we also submitted a subset of samples for short-term leach tests and kinetic testing. There's a significant number of kinetic tests that were performed on these -- these samples, including forty-eight (48) samples of kimberlite and process kimberlite and twenty-four (24) samples of mine rock.

Slide 101 provides an example of the type of data that we would obtain from a kinetic test cell. These graphs in particular show chloride data for the ongoing test work that we started in 2010 and 2011. There's additional humidity cell test and column test data that's available in Appendix 8.2, including all of the different parameters and all of the different test cells.

In this particular -- in these graphs the 'X' axis represents time in weeks from the start of the test progra -- or from the start of the test and the 'Y' axis provides concentration. And again, this is for chloride as an example.

However, it's important to note on here that each of these data points actually represents an -- an analysis of about fifty (50) other parameters. So each data point is a weekly sample that's collected and analysed for approximately fifty (50) parameters.

Now even though there's a lot of information on this slide, and I don't expect you to -- to comprehend and grasp that immediately upon looking at it, I'd like to point out a few key things here, and that's the data that we would typically use to develop a water quality estimate for a program.

So we would typically use the first five (5) weeks of data as a early time data, which would represent a first flush of the material, or the initial water that could -- would -- would encounter this material right after it's -- it's deposited on the site.

And then we look at the later time data, either -- well, the last five (5) weeks of -- of testing typically, we would average that out for a curve like this, because most of the parameters typically start out with higher concentrations and decrease over time unless the pH changes, in which case you can get some -- some other changes in -- in the graph, but we would analyse those on a parameter by parameter basis.

But typically we use the first five (5) weeks and the last five (5) weeks of data to develop our short-term leach or our -- our -- our first flush in our steady state concentrations. And these are the two (2) parts of the curve that we would take forward into the water quality modelling aspects of the job.

We're onto slide 102 now. And now that we've discussed some of the types of testing and the number of samples collected, I'd like to give you some indication of what we found with all this test work.

I'm going to talk about the mine rock first. The mine rock is the rock that's going to be removed to access the ore and it's primarily composed of granite or variations on granite, somewhat possibly altered, a little bit of diorite in there, as well.

The re -- results of this testing of this material, or these greater than twelve hundred (1,200) samples, show that there's very little sulfide minerals in -- in this rock, in this granite. And there's also small amounts of buffering capacity. Overall the materials are generally non-acid generating, or they don't have sufficient sulfide minerals to generate significant acidity.

So -- and these non-acid generating

samples account for about 98 percent -- well, they account for more than 98 percent of the rock samples tested. Humidity cell testing conducted on these samples confirm that low sulfide minerals -- or low sul -- low sulfide materials aren't likely to generate acidity, with only one (1) of the twenty-three (23) mine rock humidity cell tests generating any acidity. And the cell that did generate the acidity had about 0.1 percent sulfide and a very low neutralizing potential for that particular sample.

Elemental analysis on the data set showed that the primary solid phase rock components are aluminum and silicate as you would expect with the granite. And there was some elevated concentrations in molybdenum and zinc that were above a typical crustal abundance.

Short-term leach tests and kinetic tests show a potential for metal leaching -- sorry, a low potential for metal leaching. And leachate results from the kinetic tests were used in the overall water quality analysis, which is the subject of the next presentation.

So we take all of this data and we use the leach test results from the kinetic tests typically to represent the water quality, and we do that for all of the different parameters.

We're onto slide 103, with respect to processed kimberlite. Now it's anticipated that the kimberlite excavated, of course, is going to be processed, is going to produce a processed kimberlite. So the process of -- you know, in that process, materials are ground and -- and pretty well mixed together. The results for the testing of processed kimberlite, which I may also refer to as PK if I slip, they show that all of the samples are characterized as non-acid generating. So all of the processed kimberlite samples are non-acid generating following the criteria in the guidance documents. And they have significant excess buffering capacity. What this means is that these materials can neutralize much more acidity than they can produce. Humidity cell tests confirm that these materials are non-acid generating with excess buffering capacity, as well.

If we look at the elemental analysis it shows that the fine processed kimberlite and the course processed kimberlite are similar in composition. Fine PK or processed kimberlite has slightly elevated metal values compared to the coarser PK. And this is likely a function -- could be a function of one (1) of two (2) things. It could be -- just be the test method in terms of the acid digest of the sample, or it could be a function of the crushing process whereby some of the softer mineral -- minerals would preferentially be crushed to the finer grain size and -- and show some slight differences in the concentrations.

And for the PK, or processed kimberlite, parameters, nickel, cobalt, chromium, magnesium, selenium, and strontium in the solid phase were slightly elevated relative to typical crustal abundance.

It's important to point out that a solid phase concentration of a particular element does not necessarily mean that element will end up in the water.

It just means that we want to look at that element as we do our leach testing to determine in -- in particular we want to look at those elements to get a better understanding of -- of their leach characteristics.

Slide 104, we're going to continue talking a little bit about processed kimberlite with respect to the leach tests.

The short term leach tests and kinetic tests also -- or all show neutral to slightly alkaline pH values with a low potential for metal leaching, with the fine PK, again reaching slightly more metals and other elements than the coarse PK, and this is likely a function of the grain size of the material.

And we also analysed water from the process test work. So as the process testing was completed to understand the -- the extraction, we took samples of the water from that process test work.

And what we found is that the process test water -- or sorry, the process water test results were very similar to the short-term leach test results.

And these wat -- these waters -- or the understanding of the water quality from the process waters, the short-term leach tests, and the kinetic tests are all carried forward in the water quality analysis, which again is subject of the presentation next.

Of note is that as a result of the initial water quality analysis, phosphorus was identified as a parameter, which we considered required some follow-up work.

And I'm just going to talk about that briefly on slide 105 here. So before I go on to summarize, I -- I want to speak about how we go about determining what parameters we need to look at more closely, and how we proceed with supplemental test programs, so how do we decide that we need to -- a supplemental test program for a parameter, and then how do we go about doing that.

And I think it's very important to realize that the scientific process is an iterative one. That's to say, as we find out more information we can better focus on what's important. An example of how this process works is -- can be found in our evaluation of phosphorus.

With respect to phosphorus, we decided to look at this particular parameter in more detail because of the results from one (1) of the submerged column tests that we ran, this, coupled with our preliminary water quality model that appeared to be providing unrealistic estimates of phosphorus concentrations. This led us to the conclusion that we needed to better understand phosphorus as a source term and particularly at low detection limits. So we initiated a supplemental test program to evaluate phosphorus.

The supplemental test program consisted of procuring and producing additional samples of processed kimberlite. We completed approximately 21 analyses of these samples, along with initiation of ten (10) kinetic test cells. The kinetic test cells included subaerial, or -- or standard humidity cell tests plus submerged tests.

And with respect to analysis of these samples, we conducted the analysis of these samples at a very low detection limit so that we'd have a better understanding of what real phosphorus values were moving forward.

And as -- what this has done is it's allowed us to better understand the rates of release of phosphorus over time from the solid phase material to the liquid phase, and that's what we're going to be carrying forward into additional work on the water quality modelling.

Now I'm going to summarize in slide 106. So in summary, we completed a comprehensive geochemistry program on representative samples of the materials, of the solid materials found to be expected on site.

Based on the samples testing -- tested, acidic drainage is not expected at this site. However, there will be a monitoring program, and as at all mines there will be a rock management plan.

There is a small amount of rock with some potential to generate acidity -- or to -- for acid generation. However, it's important to note that there are several mitigation options and available if necessary to deal with these materials during operations.

From the leach testing and kinetic testing, concentrations of metals, major irons, and nutrien -- nutrients were evaluated, and were carried forward into the water quality model. Supplemental data was also collected, particularly with respect to developing a better understanding of phosphorous.

And in conclusion, we consider that the geochemical program completed for the Gahcho Kue project is robust, and we are confident that our understanding of the possible geochemical conditions on site will lead to sound decision making that will help protect the environment. Thank you.

QUESTION PERIOD:

THE FACILITATOR HUBERT: Chuck Hubert, with the Review Board. Thanks very much for that presentation. I'd like to -- well, I'll give parties the opportunity to ask a question or two (2) if there are any, on that.

(BRIEF PAUSE)

THE FACILITATOR HUBERT: Okay, thanks. Then...

MR. PAUL GREEN: It's Paul Green, with Aboriginal Affairs. Just a couple of quick ones. From your first slide I -- I read that there was 98 percent of samples are non-acid generating, which would be about 2 percent that are potentially acid generating. My previous understanding had been that it was more on the order of 6 percent. I guess there may have been some additional data collected.

Is that the case?

MR. KEN DE VOS: Ken De Vos with Golder Associates. There are actually a couple of different ways to evaluate acid generation potential. And the 6 percent comes from using a ratio of neutralization potential to acid potential, not considering the amount of sulfide mineral in -- in the sample.

When we combine both the ratio of NP to AP, or neutralization potential to acid potential, and we consider the amount of sulfide minerals, so the amount of acidity that can actually be generated by a sample, we find that -- that for many of those samples that contributed to the 6 percent, there was less than .01 percent sulfide mineral in those actual samples.

So there's not an appreciable amount of

acid generating materials in those, to actually generate acidity. So our classification of the 98 percent excludes those samples that -- that don't have appreciable amounts of sulfide minerals in them.

Ken De Vos of Golder. I'd -- I'd just like to -- to point out that there's an error in the slide. And that is slide 94, slide 94 up on the screen. It says the majority should read -- and 98 percent of the mine rock is considered non-acid generating, not what it currently reads on the screen.

MR. ALAN EHRLICH: It's Alan Ehrlich. I -- I'm confident that most listeners read it -- read it that way.

I have a question. I was wondering if you could talk a little bit more about the -- the 2 percent that is pote -- or roughly 2 percent that is potentially acid generating.

How homogenous is your rock? Is this 2 percent that's distributed throughout the rock we're dealing with? Is there a particular patch where you're expecting to have to deal with potential acid generation? If it is dis -- if it is not homogenous, do you have a way of recognizing when you've hit that period so that you understand when you should be able to mitigate it? Can you talk a little about the -- the distribution of that? Thanks.

MR. KEN DE VOS: Ken De Vos with Golder. Yeah, I can talk a little bit about that. The sulfide minerals -- if -- if we look at that 2 percent of -- of material, sulfide is associated with -- primarily with secondary fracture infilling, and it's disseminated.

So there are fractures throughout -- throughout the site, small fractures. The nu -- a number of the samples, there's -- there's slightly more samples associated with the 5034 pipe, in the rock around the 5034 pipe, than there are with the other pipes.

However, that's about seventeen (17) of the two thousand eight hundred (2,800) or, sorry, two thousand six hundred (2,600) samples or, sorry, twelve hundred (1200). Seventeen (17) of the twelve hundred (1200) samples, approximately, have some potential for acid generation.

And, you know, I'd like to point out that that doesn't mean that those particular samples are going to generate acidity. And when taken in bulk with the large amount of samples that have some minor excess neutralization potential, it's unlikely that acid generation will occur at this site; that said, as mentioned earlier, there will be a monitoring program for the site rock as part of operations.

I hope that answers your question.

MR. ALAN EHRLICH: No, I think it does if the monitoring program is what you will be relying on to decide when to use the mitigations that you've identified you have.

(BRIEF PAUSE)

MS. VERONICA CHISHOLM: Veronica Chisholm from De Beers. Yes, we will be monitoring. And based on the results or outcomes of the monitoring we will put in additional mitigations as necessary.

Does that answer your question?

MR. ALAN EHRLICH: It sure does. It sounds fortunate that you've got an abundance of alkaline material there to work with if you need to mitigate this stuff. I'm sure that many diamond mine developers look forward to finding this little potentially acid generating rock when they're doing their initial scout out. So it's nice to know that, at least from what we've heard here, this may not be a major issue. I'm going to hand the chairing back to Chuck.

MR. TODD SLACK: Todd Slack, Yellowknives Dene. I guess I have to start this question with a bit of a preamble.

At the Snap Lake mine, for instance, we've seen water flows let's say -- I don't have the numbers handy, let's say 30 percent higher than normal, we've seen TDS predictions proved -- they've turned out to be 40 or 30 percent higher than the original prediction. Nitrates, other -- and now directly related to the geochemistry or the elements in this case.

With that kind of perspective in mind and understanding how those predictions went awry, what contingency planning is in place for both the flows and the geo-chemistry and nutrients for this site if it turns out that the predictions are again a little bit off?

For instance, has there been a test run -- and, you know, I realize this isn't TDS, but has there been a test run to examine plus/minus 25 percent TDS? And I -- I'm just using this as an example because of how important the concentrations are for your closure and just your operations plan.

Or plus/minus 25 percent flow -- and we -- you know, these are -- this is a solid rationale, we've seen this. So if the company can speak to what contingency planning is available, I'd appreciate that.

(BRIEF PAUSE)

MR. KEN DE VOS: Ken De Vos, with Golder Associates. Before we respond to the question I would first like to point out that your -- the comments with respect to Snap Lake, there are a couple of -- I also work on Snap Lake and we have tracked inflows relative to predictions and we have tracked TDS concentrations relative to the predictions.

And for the discharge from the mine site, both of those are actually tracking right on the predicted values from the 2001/2002 environmental assessment. Now it's true that there is an undated prediction, but that's a subject of another -- another hearing and I don't think it's relevant to necessarily bring those into this particular hearing.

But I did want to respond to the -- the first comment, that -- that those predictions from the environmental assessment are tracking very well with the flows and the TDS from the mine.

With respect to contingency, the -- there is ample room and ample mitigation available if we encounter more acid generating materials onsite in terms of mitigation plans for those materials. And I believe there's another part.

MS. VERONICA CHISHOLM: Veronica Chisholm, from De Beers. Yes, I'm just awaiting some additional information from the engineers to answer the second part of your question, Todd, in terms of the -- the te -- 25 percent test runs. I think that was what you were specifying.

So if you could just allow us after the break to maybe come back with that respo -- are you ready?

MR. WAYNE CORSO: Sure.

MS. VERONICA CHISHOLM: Oh, sorry. Wayne Corso will respond to that part of the question. They sneak up from behind me.

MR. WAYNE CORSO: Yeah, Wayne Corso, JDS. Just dealing not with the chemistry part, but with the -- the volume in the water management plan, and one (1) of the things that the strengths of the -- of the plan itself is when we create this isolated basin and pump down the lake it gives us the capacity to handle some of these upset conditions.

And we looked at a couple of -- a couple of specific upset conditions. One (1) is wet years.

So that would sort of address your concern about volumes of water much more than we'd anticipated. We looked at one in hundred year storms. And if those storms occur during years when we're -- we're pumping annually, which is the first four (4) years of the -- of the base case project, then we're fine. We -- we pump more water out because the -- the quality is -- allows us to do that. So no problem there as far as quality.

The -- the other upset conditions we looked at were, say, the quality does not allow us to discharge, and then we've got to store the water. And, in that case, we've got, with no di -- discharge at all, two (2) years in order to, you know, take our mitigative measures, get the quality where we need to do, divert other in -- flows coming into the -- into the controlled area so that we can -- we can handle that kind of water.

So those are the types of things that we have looked at. We can get you, you know, the -- the actual numbers for those upset cases if -- if that would be helpful for you. But -- but just to let you know that the -- the actual design of the -- of the system such that we isolate and -- and drain the basin gives us that kind of flexibility to work with those upset conditions. Thank you.

MR. TODD SLACK: Thanks. Sorry. Todd Slack, Yellowknives Dene. And I didn't catch your name. But if you could provide, excuse me, tho -- those kind of contingencies as -- as the mine development goes I would be very interested to see that.

Now just one (1) point of clarification. Ken, could you say that first part over again just to make sure I understood what, sorry, you were saying.

(BRIEF PAUSE)

MR. KEN DE VOS: Todd, it's Ken De Vos here. Which -- sorry, which part were you referring to, Todd, the -- of the first part? Which part of the first part were you referring to?

MR. TODD SLACK: Ken, you're here tomorrow?

MR. KEN DE VOS: No.

MR. TODD SLACK: Oh, I was going to go back and look at the transcript, but...

I'll -- I'll think about it. I'll come back to it.

THE FACILITATOR HUBERT: Chuck Hubert,

Review Board. It's possible that the following presentation on water quality might jog your memory, possibly.

MS. VERONICA CHISHOLM: And Veronica Chisholm, from De Beers. And we'd be happy to go over and look at the transcript with you at the break, Todd, so that we can understand what the question is. Thanks.

THE FACILITATOR HUBERT: Chuck Hubert, with -- with the Review Board. With that, if we can continue with the water quality presentation. Can you give me an estimate roughly of how long your presentation --

MR. MICHAEL HERRELL: It's Mike Herrell, from Golder. It's about thirty (30) minutes to forty (40) minutes.

THE FACILITATOR HUBERT: Well, according to our agenda we are five (5) minutes from our scheduled -- scheduled break. So how about we take a break now and -- and you can relax and have all the time you need for your presentation afterwards.

So a ten (10) minute break. See you in ten (10) minutes.

MS. VERONICA CHISHOLM: Veronica Chisholm, from De Beers. I think that I noticed that

Steve Ellis is here, so we could perhaps read the response to the question before we had our lunch break, so I'm going to have John Faithful respond to that now.

MR. JOHN FAITHFUL: John Faithful, Golder Associates. This is a -- a response to a question from Steve Ellis, Treaty 8 Tribal Corporation. And let me paraphrase the question and get confirmation that it's -- it's still correct, Steve.

And that was to confirm that the 2004 study that was referenced in the permafrost baseline was the -- the only document that was used to characterize the permafrost conditions. He's nodding.

Yeah, so in answer to that -- to that question, yes, the AMEC 2004 draft report titled, "Gahcho Kue Pre-feasability Study Geotechnical and Geophysical Site Investigations," which was prepared for De Beers, was the only document that was utilized to characterize the permafrost conditions on site.

With respect to -- to your -- to follow up on the active layer, currently there's no evidence of the active layer on site not freezing through the winter. However, even if it did it would not change the conclusions of the EIS, as the results of the assessment are not depend -- not dependent on the development of all continued existence of permafrost in the area.

(BRIEF PAUSE)

THE FACILITATOR HUBERT: Chuck Hubert. Thanks very much for that response.

Todd, were you waving your hand?

MR. TODD SLACK: Thanks, I -- I was. I think I got to the bottom of what I was getting at, what the first part of the first part was. Todd Slack, Yellowknives Dene.

Now, Ken, you said that TDS and flows from Snap Lake -- because I understand that this -- this is part of a different process, but the nature of models and the nature of these predictions matters, because that's what we're going on here. So if it turns out they were 40 percent wrong on that one (1), you know, why couldn't they be 40 percent wrong on this one (1)?

Now I want to understand that you said that they are tracking exactly as predicted. I think that's what I heard.

MR. KEN DE VOS: Ken De Vos, with Golder. Yeah, I -- I want to be clear, and -- and I -- you know, Snap Lake is a different process, so I don't want to go into huge amounts of detail. And -- and I think I may understand the discrepancy between your percent difference in my tracking.

I have the tracking records and the tracking records for Snap Lake are provided in each annual report in terms of loading at the discharge that's in the ARD Report. And those loading and cumulative loading trends from the discharge pipe to Snap Lake are -- are what is tracking very well within Environmental Assessment predictions.

Now I think -- and -- and you can check the Snap Lake ARD, annual ARD Reports to confirm that if you wish.

MR. TODD SLACK: Todd Slack, Yellowknives Dene. Yeah, we'll pursue that through an Information Request.

THE FACILITATOR HUBERT: Chuck Hubert, Review Board. Thanks very much. I think we're ready for about a ten (10) to fifteen (15) minute maximum break. Thanks. See you then.

--- Upon recessing at 2:42 p.m.

--- Upon resuming at 3:00 p.m.

THE FACILITATOR HUBERT: Chuck Hubert

with the Review Board. Welcome back everybody from the break. If -- we have some interesting topics up next, water quality, and I'd like to turn the mic over to De Beers to discuss it. Thanks.

PRESENTATION BY DE BEERS CANADA RE WATER QUALITY:

MR. MICHAEL HERRELL: Good afternoon. My name is Mike Herrell from Golder Associates. I'm going to talk about the -- the effects to surface water quality.

I'm actually very excited to give this presentation now because there were several questions this morning that I think will be covered off at the end of this presen -- presentation.

Mark had a few questions about the -- the Tuzo pit stability. This water quality model brings together a lot of the assessments that were discussed this morning by Ken and Nathan and Don, so a lot of the -- the questions that were asked were -- are more appropriately answered as a part of -- as this presentation.

So -- so on slide 108 is an outline of my presentation. To begin, I'll discuss the -- the key lines of inquiry in the terms of reference that guided the assessment, and present the key sections in the EIS where information can be found, including the methods and the results.

I will then discuss the baseline studies that have been completed to date to -- that were used to characterize the baseline condition for the project LSA, and the RSA.

I will then provide an overview of the assessment approach, which included incorporating the results of hydrology, hydrogeology, and geochemical assessments that I previously mentioned, and how they're incorporated into a single model that projects the -- the surface water quality for Kennady Lake, and the -- the downstream watershed.

More specifically for the surface water quality evaluation, I'll discuss also how the project air emissions, the surface water quality model, and the Tuzo pit hydrodynamic model are accounted for in the simulations.

And finally I'll present the -- the winter oxygen depletion rate modelling that was completed to further assess the outputs of the -- the surface water quality model.

And finally to -- to finish off, I'll -- I'll provide a discussion of the approach, and how these -- the -- the results from the -- the surface water quality model, and how that was carried forward into the -- the aquatic risk assessment, how that assessment was completed, and the results of that assessment.

I've moved to slide 1 -- 109. So as John Faithful mentioned this morning in the -- the aquatics introduction, based on the terms of reference for the Gahcho Kue project, effects on water quality were captured primarily in two (2) key lines of inquiry.

These were water quality and fish in Kennady Lake, which is covered off in the EIS in Section 8, and downstream water quality effects, which are covered off in Section 9 of the EIS.

And to provide a couple of excerpts from the terms of reference that guided the assessment, verbatim:

> "The EIS must provide a detailed analysis of all impacts, including a comprehensive analysis of potential impacts on water quality of Kennady Lake as a result of possible contamination. Also, the EIS must provide an evaluation of the potential downstream effects, and the

extent of the impact."

The results of the -- the water quality assessment also serve as an input to the -- the fish assessment, which will be discussed tomorrow.

I'll now discuss the -- the existing environment for the -- the Gahcho Kue project with respect to surface water quality.

It's important to have a -- a good understanding of -- of the existing conditions, because that forms the -- the basis for evaluating the effects to surface water quality from a project.

At the Gahcho Kue project, there is a very good understanding of the existing condition, and it's been developed through several studies that span several years. So the existing environment data for water quality and sediment data was collated from historic data sa -- historic data sources within Kennady Lake watershed, the LSA and the RSA -- and for those on the webcast, I'm now on slide 111 -- and then more recent field surveys that were conducted as part of the -- the EIS within the Kennedy Lake watershed and within the -- the local study area.

Moving on to slide number 112, field programs that have been completed within the L -- LSA include twenty-three (23) water quality sampling programs between 1995 and 2005, and also between 2010 and 2011.

These surveys had an emphasis on the Kennady Lake watershed and monitoring included open water and under ice condition surveys, sampling for water chemistry data and water column profile data.

Sampling programs to characterize the sediment properties and chemistry were also conducted. These included surveys in Kennady Lake in 2004 and 2005, and then also in 2010 and 2011.

So the existing data set for sediment and water quality for the Gahcho Kue project is quite abundant.

To provide -- slide 112 presents a summary of the existing environment water quality studies that were mentioned in the -- the previous slide. Some key observations that can be drawn from the water quality assessment include the water quality is similar throughout Kennady Lake and other lakes in the LSA, and that seasonal variability is low.

Lakes exhibit season -- seasonal physical chemical characteristics, and most lakes have low concentrations of total dissolved solids, alkalinity and hardness, and also total suspended solids.

The lakes can be characterized as oligotrophic and phosphorous limited. The lakes have total -- have low total organic carbon and dissolved organic carbon, but do possess some colour, and metal concentrations are generally low. But some metals, for example, aluminum, cadmium, copper, iron and zinc, have been reported above the -- the aquatic life guidelines, the CCME guidelines for the protection of aquatic life.

I'm on slide 113 now. This slide presents some of the key observations of the existing sediment characteristics based on samples collected in the -- the sampling programs mentioned on slide 111.

Sediments can be characterized as being mainly composed of sand with approximately 70 percent of it being sand, with low -- with a low silt content of approximately 25 percent and very low clay contents, with approximately 2 percent.

There is low to moderate organic carbon content found within the sediments, and concentrations of most metals in Kennady Lake bed sediments are below sediment quality guidelines. But arsenic, cadmium, chromium, copper and zinc have been measured above guideline concentrations in samples collected from the studies that were presented on slide 111.

On slide 114, there are some additional

studies that are ongoing, and future studies. The purpose of these is to add to the existing environmental database, to collect additional water and sediment quality data in target locations.

These programs included under ice and open water conditions and targeted freshet monitoring. And these studies incor -- included in situ monitoring of physicochemical parameters and turbidity.

And some of the key purposes of these studies is to transition the baseline data set to the collection of AEMP data and also apply updated analytical techniques to measurement of ultra-low metals and nutrients, specifically phosphorous, as a -- as appropriate. And also to include chlorophyll A sampling in association with -- with nutrients. And, finally, to improve the -- the sediment nutrient data.

I'm now on the -- the next slide, which provides the assessment approach. The -- the existing environment discussed in the previous slides form the basis of evaluating water quality effects of the project. This information formed an input to a comprehensive water quality assessment that considered the results of the assessments presented by Don, Nathan, and Ken as inputs in the model also.

The Service Water Quality Assessment was completed as four (4) individual assessments that are all interlinked. And I -- I mentioned these previously, but to repeat, these include the effects to water quality from project air emissions; effects to service water quality in Kennady Lake and in the downstream watersheds; and the Tuzo pit lake refilling and the stability of the pit following repill -- refilling -- just as a clarification, the stability of the pit lake following refilling -- and also a winter oxygen depletion rate modelling within Kennady Lake.

So, I'll present the -- the approach for each of these modelling efforts individuallym and discuss how the results are carried forward into the -- the Aquatic Health Risk Assessment.

So the first assessment I'll talk about is on slide 117 which discusses the -- the project air emissions.

So, project air emissions. Effects from project air emissions were evaluated using an air quality dispersion model which Dennis Chang presented in detail on Wednesday. This model produced the following outputs that were used to assess the effects of project air emissions on surface water quality. These were mass loadings to Kennady Lake and in the downstream watersheds, and also the potential for lake acidification as a result of deposition -- deposition of acidifying air emissions.

Moving on to the surface water quality model on slide 118. The effects to surface water quality were evaluated using a conservative mass balance model developed in the GoldSim modelling package. For those who are not familiar with Gold -- the GoldSim modelling software, to provide an excerpt from the water quality modelling appendix in the EIS, Appendix 8.1:

> "GoldSim is a graphical object oriented mathematical model where all input parameters and functions are defined by the user and built as individual objects or elements linked together by mathematical expressions. The object based nature of the model is designed to facilitate the understanding of the various factors which control an engineered or natural system and predict the future performance of the system."

I'll present an -- an overview of the GoldSim software package in the upcoming slides. So in -- to provide a clarification on how the -- the software tool is used to calculate the water quality -- to project the -- to project the water quality for Kennady Lake and the downstream watersheds.

So, as I previously indicated, water qualities were projected for both Kennady Lake and the downstream watershed. And this was done in GoldSim by itemizing all inflow volumes to water bodies and assigning them a water chemistry selected from either the baseline information or geo-chemical testing to account from loadings from natural areas, disturbed areas, mine rock runoff, and fine and coarse PK runoff, and the groundwater inflows to the -- the open pits.

Moving on to slide 119, to bro -- before I -- I get into a detailed discussion of how the model calculates water quality, I'd like to provide a -- an example of how the source terms were selected. And Ken brushed on this in his presentation also.

So, in this slide is a typical water quality trend that is observed in humidity cells. The trend is characterized by initial high concentrations that are follow -- in the first five (5) weeks of testing; that is seen on the left of the figure. Followed by a steep decline of concentrations until a steady state is generally reached later in the humidity cell test.

As Ken indicated in his presentation, the -- the concentrations in the first five (5) weeks are used to represent the water quality during first flush and the last five (5) weeks is used to -- generally used to represent steady state concentrations.

The way the -- the humidity cell information was incorporated into the -- the GoldSim water quality model for the -- the Gahchoe Kue project was quite conservative in that each humidity cell there were several humidity cell tests for various materials. So to provide an example of fine PK, the -- all of the humidity cells that were run for the fine PK materials, the maximum concentration from each of those three (3) tests was assigned to the first flush water quality from a particular facility.

Similarly, the maximum concentration observed in the last five (5) weeks of the humidity cell testing was assigned to the -- the steady state flows following freshet. So within the modelling environment the -- the maximum concentrations are applied during freshet.

Now, freshet accounts for 56 percent of the annual flow to the -- the lakes, so the maximum concentrations observed in the first five (5) weeks are assigned to the -- to more than half of the flow to calculate loadings into Kennady Lake.

So moving on to slide 120. These slides are animated for those who are on the web cast, so I'll do my best to try and explain how things are flying around the screen as I -- as I move through these -- these slides.

So I just would like to give an overview of how the water quality is calculated in GoldSim so it's clear to everybody how our numbers are generated. So GoldSim -- I gave a very technical description from the EIS of how GoldSim works but, to simplify, it has elements designed to facilitate water quality modelling.

So some of these elements are reservoirs. And the purpose of a reservoir is to track a volume within the modelling environment. So, it has an inflow assigned to it and an outflow assigned to it and the purpose of the reservoir is to calculate the volume of water in a water body.

Now, I'd like to clarify that the -- the picture here, the simulated volumes here, are not related to the Gahchoe Kue project and are only presented for -- for illustrative purposes only.

In the handout, I am now on slide 120.

So reservoir elements are connected to what are called mixing cells. The purpose of a mixing cell is to track chemical mass in a model. So the volu -- the inflow to each mixing cell is assigned a concentration which equates to a mass that flows into that mixing cell and the outflow is assigned the concentration within the mixing cell to remove the appropriate amount of mass to transfer it to wherever -- wherever that flow may -- may report to.

So cell pathways are used to track the -- the mass inflow and the outflow rates to simulate the -- the water quality of -- of a water body, since -- if we know the mass that remains within a water body and we know the volume, the quotient of the two (2) results in a concentration.

And in the -- the presentation, for those on the web cast, I'm now on slide 122 which shows a typical output from -- from a mixing cell. And again, these mixing cells -- sorry. The results from this mixing cell are only presented for illustrative purposes and are not related to the project.

So the -- the previous slides presented a conceptual high level overview of how the surface water quality is calculated in the GoldSim interface. Now I'll go through how we use this software to develop a water quality model for the -- the Gahchoe Kue project.

So the first step is to develop a conceptual flow model for the site. And the water quality model was built as a cell network in which each of the key areas within Kennady Lake or in the downstream watershed were divided into various areas shown here on slide 123.

So at each stage of the -- the mining cycle each flow is itemized and assigned a water quality and a proportional mass exchange was evaluated monthly to calculate water quality for each area.

So on slide 124, you can see flows during the mine de-watering, the initial mine de-watering, where water will be pumped from the areas 3, 5 to Lake N11 and then also to Area 7 to Area 8.

One (1) of the -- the advantages of the -- the GoldSim modelling software is that it is robust enough to incorporate changes to flow pathways on a continuous basis. And this is useful for -- to facilitate tracking of water quality.

The Water Management Plan that was presented, I believe on Monday, was built into the GoldSim water quality model to provide a continuous record of the flows as they change.

So I'm not going to go in detail of all the -- the various changes from one (1) stage of mining to the next, but I just want to point out that the GoldSim water quality model -- I'm now on slide 125 -- accounts for all of the changes in the flow throughout the -- the construction period and the -- the operations period, and moving into the closure period, where I'm now on slide 129, when Kennady Lake is refilled, and then also in the post-closure period once Kennady Lake is refilled and then reconnected back to the -- its downstream watersheds.

I am now moving on to slide 131. So one (1) of the -- the components of the Water Management Plan is the refilling of Kennady Lake and the refilling of Tuzo Pit at closure. The proposed Water Management Plan indicates that water -- at closure water will be directed to the Tuzo Pit from Kennady Lake, areas 3, 5, and Area 7.

So the water level will be drawn down to 417 metres and then the -- the surplus water above that elevation will be moved into the -- the Tuzo Pit to expedite the -- the refilling of the pit and also to try to isolate a higher TDS water that may be stored in the water management pond in the bottom of the Tuzo Pit.

So to isolate the -- the high TDS water in the bottom of the pit, meromixis will have to form. And to evaluate whether meromixis would form within the Tuzo Pit, a hydrodynamic model was completed and also incorporated into the -- the site water quality model.

So two (2) -- two (2) water quality models were completed to -- to assess the -- the meromixis in the Kennady Lake -- in -- sorry, in Tuzo Pit. And for the benefit of those on -- on the webcast, this slide is also animated, so you may not be able to see the -- the figure related to the CE-QUAL model on the presentation. It's -- it's likely hidden behind the -- the mass balance model results which run for fifteen thousand (15,000) years into post-closure.

But all of the results of the hydrodynamic model and the figures that are presented in this slide can be found in Section 8.8.4.2.1 of the EIS. Just to repeat, 8.8.4.2.1.

And the -- the assessment approach is also presented in Section 8.I.4 in Appendix 8.I of the -- of the -- the EIS. I -- I can direct anyone during the break to where that is located in the EIS. I have it here with me.

Sorry, I -- I went through this fairly quickly and I -- I brushed over not defining what meromixis and pycnocline development is.

Meromixis is the development of two (2) distinct water quality signatures within a -- a pit lake. So where you have high TDS water located at the bottom of the pit, and a -- a TDS -- or water with a different TDS signature overlying that. The pycnocline is the boundary between these two (2) types of water.

So to discuss the results of the -- the hydrodynamic modelling, first I'll -- I'll present the -- the CE-QUAL model results which are presented in the first figure here on slide 131.

So the initial conditions above 100 metres and below 100 metres were identified based on the output from the -- the GoldSim water quality model.

The -- the CE-QUAL model was then allowed to run, and what it indicated was above approximately 125 metres the concentrations of TDS decreased through time. So the individual lines on this figure represent different snapshots in time, and the years are indicated at the -- the top of the figure.

Below this depth, TDS concentrations generally remain the same, indicating that meromixis is forming within the pit, and that two (2) distinct signatures of water quality will exist in the Tuzo pit at closure.

Another key observation from this slide is that the pycnocline development does move downward, because the -- as you see in the figure the concentrations at different times below 400 metres move to a deeper -- deeper depth, and above that depth the concentrations are -- are somewhat diluted.

In addition, to look at the -- the long-term effects in the Tuzo pit, a spreadsheet model was developed where the Tuzo pit was divided into several segments, and groundwater inflows were introduced at the varying depths at different concentrations to evaluate how the concentrations would change over a long period of time, up to fifteen thousand (15,000) years in this figure.

So the key observations from this figure indicate that the initial boundary conditions that are -- are built into the model above 100 metres and also below 100 metres, the TDS -- the different TDS signatures, don't change -- they -- they do change, but not for -- it requires a significant amount of time before the TDS concentrations change at varying de -- at varying depths within the -- the Tuzo pit.

As you can see, it requires at least a thousand years before the concentrations below 250 metres deviate from the -- the initial boundary condition after the Tuzo pit is -- is flooded.

And it requires more than fifteen thousand (15,000) years for concentrations to increase significantly at depths, and below 150 metres, but above this -- this elevation the concentrations do not really change with time.

So to -- to visualize this, on the -- on the next slide I -- I've put in a few other animations to -- to show how the -- the pycnocline will develop through time.

So the Tuzo -- I'm on slide 132 for -- for those on the call, and I believe on the -- the handout the -- the animations are broken into a series of slides of 'A' through 'B', et cetera.

So initially at closure there'll be no water in the Tuzo pit after mining is complete, and the Tuzo pit is approximately 300 metres deep, ranging from 121 metres above sea level to 409 metres above sea level approximately. The total capacity of the pit is approximately 41 million metres cubed.

So as I presented initially, the water level in Kennady Lake will be lowered to direct water into the -- into the Tuzo pit. The signature of this water has a higher TDS concentration.

Following -- and this -- this water -- the change in the water elevation results in about 16 million metres cubed of water being directed towards the Tuzo pit.

So I am on slide 132, I think it's 'B' -- 'B'. The water above the 16 million, the -- the pit will then naturally refill from surface runoff, groundwater inflows, and also water pumped in from -- from N11 that is pumped to expedite the -- the refilling of Kennady Lake.

And this accounts for about 25 million metres cubed of the remaining water that will be -- to fill up the capacity of the Tuzo pit.

As I indicated on the previous slides, pycnocline will develop between these two (2) -- two (2) water qualities. However, through time the pycnocline will migrate downwards, and it becomes roughly stable when there's approximately 9 million metres cubed of water in the Tuzo pit. And as the pycnocline moves down, the higher TDS water is released into the -- the lower TDS water and mixed with the -- the lower TDS water in the -- in the water quality model.

I think it's important to point out that the concentrations that were simulated in the water quality model -- up until this point I've been talking about high and low TDS. Just to create some clarification around that, the low TDS is about 100 milligrams per litre. And the -- the high TDS that was simulated was about 500 milligrams per litre in -- in the bottom of the -- the Tuzo pit.

So what drives the pycnocline moving down is -- is mainly wind, initially. And I'm on slide 133. So the wind energy at the surface is strong and a lot of mixing will occur at the surface. But as you get deeper down into the Tuzo pit, the -- the wind energy will gradually decrease until the point where the pycnocline is no longer affected by -- by the wind movement.

And it's at -- at this point -- I'm pointing to the boundary, the dark blue boundary between -- the boundary between the dark blue water in the Tuzo pit and the -- the lighter blue water above the darker blue water on the slide.

That is the boundary where the pycnocline is expected to stabilize. And this is accounted for in the -- the surface water quality model. So all of the water that remains below in this deeper, high TDS water is considered to be isolated from -- from the system in the surface water quality simulations.

So the Tuzo pit stability was incorporated into the -- the GoldSim model as a cell pathway, as I presented in the -- the discussion of the -- the GoldSim interface.

And as the py -- pycnocline moves down, deeper with time, the additional water stored in the Tuzo pit will mix with Kennady Lake. So we -- the initial water that's put into Kennady Lake with the high TDS, the 16 million, as the pycnocline moves down, a -- a mass load is introduced into Kennady Lake to account for the higher TDS water migrating up into Kennady Lake.

And that's -- that sums up that third bullet there. The change in the capacity result -- resulting from the pycnocline migration in the Tuzo pit is included in the GoldSim model.

Moving on to slide 135. A winter oxygen depletion rate model was also completed based on the -- the outputs of the -- the surface water quality model. This was developed to estimate the DO depletion under ice conditions as a result of the projected total phosphorous concentrations that were predicted in Kennady Lake.

Three (3) different approaches were used to -- to estimate the -- the winter oxygen depletion rate, and these are listed here. The first one (1), by Voll -- Vollenweider, in 1979, is based on the annual rate of carbon productivity. And Marthias and Barica, 1980, looks at the -- the sediment surface area to the -- the lake volume. And then Babin and Prepas, it's the summer total phosphorous concentration in the -- the trophic zone. And these -- these three (3) approaches are based on North American lakes.

And this model is ongoing and it's -- it's used to -- to validate the -- the projections the total phosphorous projections that were -- were provided in the -- the EIS.

I'm now going to go through the -- the assessment findings for each of the -- the modelling topics that I -- I've just discussed the -- the approaches to.

The first one on slide 137 is the changes to water quality from project area emissions. The air quality modelling indicated that there's limited spatial and temporal extents of air emissions. They're expected to result in minor changes to the water chemistry within the -- the Kennady Lake watershed.

And projected net PAI values

representing peak emissions were below the critical loads for nineteen (19) lakes studied, indicating that lake acidification is not expected within the Kennady Lake watershed.

With respect to the projections for surface water quality, several parameters are projected to increase in Kennady Lake in the downstream watershed lakes after closure. These include TDS, major ions, nutrients, and metals. And as expected projected concentrations decreased downstream in the watershed relative to Kennady Lake as more additional dilution, natural background dilution is reported to these lakes.

Metals were projected to be higher than the -- the CCME guidelines for the -- the protection of aquatic life. Within Kennady Lake, cadmium, chromium, copper and iron were above the guideline value, n Area 8, cadmium and chromium, and then also in Lake N11. And within Lake 410, cadmium was also elevated or projected to be above the guideline.

Now it's important to put this in context because the cadmium and chromium concentrations, if you remember back in my -- the existing -- the existing environment summary, cadmium and chromium were also measured to be greater than the -- the CCME guidelines for aquatic life under existing conditions.

So impacts to water quality are expected to be negligible at the outlet to Lake 410. And these -- the simulated concentrations as a part of this assessment were then carried forward into the -- the aquatic health assessment.

On slide 139, the changes to winter oxygen depletion rate I presented, so the additional -- additional depletion of oxygen under ice after closure is expected in Kennady Lake as a result of the -- based on the -- the projected concentrations of total phosphorous during the post-closure period.

However the -- the increased oxygen demands are likely to affect only 22 percent of the water volume, which is located mainly below a six (6) metre depth. And the surface zone, or the remaining 78 percent of the volume, is expected to maintain sufficient oxygen concentrations to support cold -- cold water aquatic life or have values that are greater than the CCME guideline of 6.5 milligrams per litre.

I -- I want to -- on slide 140, I want to talk a little bit about the confidence we have in our -- in our water quality modelling predictions.

Water quality projections are based on several inputs and all of these inputs have inherent variability and uncertainty. However, to address this uncertainty we built confidence into the model by applying conservative assumptions. Conservatism was applied in the groundwater inflows, the geo-chemical source terms. And in addition, no consideration of mass retention as a result of permafrost was developed or no attenuation of mass was accounted for due to geochemical or biological rea -- reactions. So the projected concentrations are expected to be greater than those that will be observed when the mine is operating and during the closure and post-closure periods.

And to further provide additional confidence into the model projections, on -- ongoing work is continuing to refine -- refine these projections as additional information becomes available from other assessments such as the -- the DO modelling.

So the results of the surface water quality were carried forward into the -- the aquatic health assessment and these are presented on -- the assessment approach for aquatic health is presented on slide number 142.

So the predicted changes to water quality on aquatic health were evaluated through two (2) exposure pathways: One, direct exposure, where a predicted water concentrations were compared with chronic effects benchmarks or CEBs to evaluate the potential for aquatic health effects due to direct water born exposure; and also through indirect effects where predicted tissue concentrations are compared with toxicological benchmarks to evaluate the potential for the -- the aquatic healths related to tissue concentrations.

The results of this assessment are presented on slide 143. And the key message from the assessment is the prose -- the proposed water management plan is designed to be protective of the environment and the project is expected to have negligible effects on aquatic life in Kennady Lake and within the downstream watersheds.

And to support this the -- the assessment indicated that the potential for adverse effects from dust and metals deposition during operations is really low within the Kennady Lake watershed and it's not expected to have effects to aquatic life. And changes to concentrations of all substances considered in the assessment predict -- are predicted to result in negligible effects to aquatic health within Kennady Lake.

Carrying the assessment downstream into

the -- the downstream watersheds, the changes to concentrations of all substances considered in the assessment were also predicted to result in negligible effects to aquatic health in water bodies downstream of the -- the Kennady Lake.

That is the -- the end of my presentation. And I invite questions. Thank you.

QUESTION PERIOD:

THE FACILITATOR HUBERT: Chuck Hubert, Review Board. Thanks very much for the presentation. And, yes, questions, please. Yeah, please speak into the microphone and announce your name. This is Chuck Hubert with the Review Board. Thanks.

MR. MARC CASAS: Hi. Yeah, I'm Marc Casas, with Mackenzie Valley Land and Water Board. Thanks. Yeah, thanks for the presentation. It did answer a lot of my questions from earlier, I believe. So I just have two (2) quick ones.

One (1) was about the question referring to the modelling of the -- of the Tuzo pit. In terms of the -- the formation of the pycnocline, or I forget, whatever it's called, that -- that line, is that -- was TDS the -- the only -- TDS and wind, were those the only factors used in assessing that?

MS. VERONICA CHISHOLM: Veronica -- Veronica Chisholm, from De Beers. First of all, I'd like to say thanks, Marc. It's nice to see someone from the Mackenzie Valley Land and Water Board participating in the Mackenzie Valley Review Board process, so we appreciate your -- you being here today, before I have Mike answer that question.

MR. MICHAEL HERRELL: It's Mike Herrell, from Golder Associates. The -- the boundary you're referring to is the pycnocline. Within the -- the hydrodynamic model the -- the modelling software accounts for temperature also in those predictions. So it'll simple -- it'll simulate TDS concentrations and it'll incorporate wind and also temperature.

MR. MARC CASAS: Okay. Thanks for that. And... Oh, my next question I guess refers to the -- the last -- the last comment or the last slide, which I think was 143. And -- and maybe it has been defined, but is -- is negli -- "negligible effects," has it been defined or how -- how was that determined?

MR. JOHN FAITHFUL: John Faithful, Golder Associates. Thanks for your question, Marc. With respect to the definition of "negligible," it's -- it's outlined in the assessment approach, which is in Section 5. And it's also outlined in Section 8.5 of the downstream key lines of inquiry. And in terms of negligible effects, it refers to a -- it refers to a concentration that's equivalent to a threshold or equivalent to -- to baseline conditions or similar to baseline conditions. Thank you.

John Faithful, Golder Associates. Just a clarification. The assessment approach is in Section 6.

THE FACILITATOR HUBERT: Chuck Hubert, Review Board. Thanks for that response and clarification. Other questions with respect to water?

MR. PAUL GREEN: It's Paul Green with Water Resources. Just a couple of questions. I just want to clarify that I understand kind of the process that happens as the -- as the pycnocline is -- is pushed down in the pit.

If you like looking at 142 -- 132B, anyway, you've got about 16 million cubic metres of high TDS water in -- in the -- in the pit about halfway down.

Okay, so the one (1) before that. You've got about 16 million metre -- cubic metres at the bottom, and then in this slide you come down -- yeah, so you start there, and then you come down to 9 million cubic metres in the next slide. The -- the 7 million metre cubic difference, I understand that that is -- is sort of over time, and -- and it's with sort of -- sort of mixed into the bulk of the Kennady Lake water, is that where that 7 million cubic metres goes?

MR. MICHAEL HERRELL: It's Mike Herrell from Golder Associates. That's correct. The results of the -- the hydrodynamic model indicate that the -- the pycnocline will require approximately a hundred (100) years to stabilize. So as the pycnocline moves down, the total volume of water -- the difference of the volume of water, approximately 7 million metres cubed, is then mixed with the overlying Kennady Lake at a linear rate over that hundred (100) year period.

MR. PAUL GREEN: Okay, thanks. And now one (1) -- one (1) final question. In the reading I've done to date, the tables with sort of the water quality summary data, I've seen mins -- minimum values, maximum values, and medians.

And I was wondering if a 95th percentile, or some sort of baseline number has been calculated anywhere? It -- it -- maybe it's in a -- in an appendix I haven't come across yet, but if it is, if you could point me towards that.

MR. MICHAEL HERRELL: It's Mike Herrell from Golder Associates. Can you clarify where you --

which tables you're referring to when you talk about those statistics?

MR. PAUL GREEN: It would be the Section 8 tables, and the -- basically just the -- the overall -- your surface water quality summary tables.

There's a discussion about how you treated the data based upon non-detects, and so -- so basically the three (3) numbers that I can get out of those are the mins, the medians, and the maxes. And I'm just wondering if somewhere in the -- in the baseline or appendices there's a -- you know, a 95th percentile type number. And if there is if you could -- you don't have to -- like if it's something you could follow, like it's -- yeah.

MR. MICHAEL HERRELL: It's Mike Herrell from Golder. If we can follow up on that, we -- we'd like to do that. Thanks.

THE FACILITATOR HUBERT: Thank -- Chuck Hubert, Review Board. Can -- can you clarify exactly again what that follow-up is? Thanks.

MR. PAUL GREEN: I guess what I was looking for was a 95th percentile water quality data number, surface water quality, if it exists in the -- in the appendices or in -- in the addenda.

THE FACILITATOR HUBERT: Chuck Hubert.

And as far as timing goes, when would De Beers be able to produce that?

(BRIEF PAUSE)

MS. VERONICA CHISHOLM: Veronica Chisholm from Be Dee -- De Beers. Yes, we'll provide that probably tomorrow, if not later on. Oh, they have more updates.

(BRIEF PAUSE)

MS. VERONICA CHISHOLM: Results from the update. Veronica Chisholm from De Beers. Yeah, we'll provide that information tomorrow, if that's okay. An update tomorrow. Thanks.

THE FACILITATOR HUBERT: Chuck Hubert, Review Board. Thanks very much. We have time, I think, for another question or two (2) on the preceding presentation.

If anybody has a question, please ask it now.

MS. VELMA STERENBERG: Velma Sterenberg, AANDC Minerals. I'm a little embarrassed about asking this question, but it has to do with the -

- the currently existing cadmium and chromium levels, and how they relate to the current fish health of the population. I -- I'm not able to be here tomorrow, but I was just quickly going through the fish habitat presentation that I assume will be given tomorrow, and I didn't see any mention of that.

And my question would be: Are the fish currently ex -- well, they're currently existing in those lakes at higher than CCME approved levels. Are they healthy? And you state that it -- those -- at least cadmium and chromium are projected to be higher. I'm assuming that the -- quantities -- higher quantities are in one (1) of the appendices that is in your report and I just haven't seen it?

And is my -- is my question clear enough? I'm more -- I'm more curious -- and I'm curious because of the geochemistry. I'm not a fish person, but if -- if the fish are healthy at higher than acceptable lever -- levels, excuse me, is there going to be a tipping point when the levels get a little bit higher and then the fish start to suffer from that? Thank -- oh, excuse me.

MR. JOHN FAITHFUL: John Faithful, Golder Associates. Thanks, Velma. At the initial -- to first answer the questions, the -- the projected concentrations that Mike -- that Mike alluded to in his presentation are only marginally above the guidelines. And I can provide you an indication to -- to the source of that.

The second part of this response is that the -- the aquatic health assessment provides a screening assessment of all of the -- the -- the maximum concentrations that Mike has predicted from the -- the long-term projections, and then through that process applies comparisons to chronic effects benchmarks and -- and -- and other comparison tools. And through that was -- was able to screen out cadmium and chromium as being a potential issue.

So the -- the fish will remain healthy.

MS. VELMA STERENBERG: Velma Sterenberg, AANDC. Thanks.

THE FACILITATOR HUBERT: Chuck Hubert, Review Board. Any further questions on the topic of water quality from participants here in the room?

MR. MICHAEL HERRELL: It's Mike Herrell, from Golder. I'd like to make a clarification on my response to Paul Green's question.

The -- the -- the -- I indicated that the -- the pycnocline becomes stable after a hundred years. The pycnocline is actually stable initially, after the refilling period. After the -- the 16 million metres cubed of water is introduced into the pit, and then it is refilled to surface. A pycnocline has already been established, that is stable. It moves down through time, through changes in the density of the TDS, and then also from the -- the wind action.

MR. JOHN FAITHFUL: John Faithful. Chuck, I'd like to just add another comment to -- to my response that I provided to Velma. And that's to -- to indicate that the -- the CCME guidelines are typically conservative and very protective. And to say that they're guidelines, they're not -- not particularly limits, and that -- and they don't -- and it doesn't mean an exceedance to them represent risks.

MS. VELMA STERENBERG: I'm sorry, I'm not used to these microphones. I'm Velma Sterenberg, AANDC.

Yeah, a couple of things with CCME. They're very conservative and also people are finding that they don't necessarily apply to northern lakes. And so, I take your points and, like I say, it was more of a curiosity than -- than -- like I said, I'm not a fish person. Okay.

MR. JOHN FAITHFUL: John Faithful, Golder Associates. Thank you very much, Velma.

THE FACILITATOR HUBERT: Chuck Hubert, Review Board. Further questions on water quality? And if not, I'll ask De Beers whether they'd like to proceed with beginning the fish topic or save it for tomorrow.

MR. JOHN FAITHFUL: John Faithful, Golder Associates. Chuck, what sort of time frame are you looking at?

THE FACILITATOR HUBERT: Can we have a minute, please? Thanks.

(BRIEF PAUSE)

THE FACILITATOR HUBERT: Good afternoon, again. Chuck Hubert, Re -- Review Board.

We've had a -- a bit of a discussion and what we'd like to do is complete the water quality in its entirety today and if there's any follow-up questions from what's gone on at -- in the preceding time today we can deal with those. And then we'll start tomorrow with fish and -- the fish and aquatic -- or fish and fish habitat topic and do that in its entirety tomorrow. We won't start the fish or fish habitat portion of the agenda today.

So -- and by the way the -- we should be done possibly by -- by noon tomorrow. It should be an -- an early morning. And if we go later than -- than noon that's fine too. But we're -- we're anticipating, let's say, three (3) hours of fish and fish habitat.

So with that understanding, let -- if there's any further questions on -- on water quality, or hydrology, or geolog -- or geo -- or geochemistry, all of the topics today, we can deal with those right now. Thanks.

(BRIEF PAUSE)

MR. JULIAN KANIGAN: It's Julian Kanigan, with Aboriginal Affairs. In looking at the agenda for today we had looked forward to a presentation on and a discussion on permafrost. And I know we've touched on it in some of the presentations.

And I'm just wondering if we can expect a presentation from De Beers on permafrost or whether that's now not on the agenda today or tomorrow?

MS. VERONICA CHISHOLM: Veronica Chisholm, from De Beers. No, there's no further presentations on permafrost. We tried to integrate it into some of the aquatic themes. We're -- we had some uncertainty about the length of time it would take us to get through some of this material, and so I guess we -- we pull -- pulled together what we could given the time that we had.

Veronica Chisholm, from De Beers. And -- but we would be happy to follow up on any specific questions you might have on permafrost and go through any of the sections with you on permafrost. Thank you.

THE FACILITATOR HUBERT: Chuck Hubert, Review Board. Thanks for that answer. Do you have any followup to that? Okay, I'll take that as a "no". Thanks.

And anybody else have questions on what we've discussed today for De Beers?

MS. MADELAINE CHOCOLATE: This is Madalaine Chocolate, Tlicho Government. Having sat here for the last couple of days I must say I've learned a lot. And I just want to thank the panel for all the details and the information that we share -- they've shared with me the last couple of days.

It seems like there's going to be a lot of study done onsite. One (1) thing that I will say is that we will be monitoring the -- the pit, the -- the work, the operation of the pit real closely and that all the information details that we've been given we're going to see that it's in -- it's in line with what's been -- what's been said here today and yesterday and the day before. Mahsi.

THE FACILITATOR HUBERT: Chuck Hubert, Review Board. Thanks very much for those comments. I'll give one (1) more opportunity to parties before -- my colleague, Alan, has one (1).

THE FACILITATOR EHRLICH: Thanks, Chuck. I have a question that is interdisciplinary, but it touches on hydrology and one (1) of the questions that DFO asked earlier today. I'm just going to extend it to a different species.

DFO asked how your predicted ramping would be affecting grayling spawning, and I think there was an element of timing in the question, although I can't quite remember.

My question has to do with water birds and how the timing of any ramping, you know, I'm bringing this out, the hydrology today because the ramping's a hydrological thing is why I didn't bring it up on the birds time, but how the timing of ramping relates to vulnerable periods regarding nesting of water birds considering among other things that the horned grebe is one (1) of the species you've identified on your list of species at risk here.

Would you care to comment on that? Have

you considered timing of ramping relative to sensitive periods in the nesting of vulnerable water birds? Thank you.

(BRIEF PAUSE)

MS. VERONICA CHISHOLM: Veronica Chisholm, from De Beers. We'd like to defer that question until tomorrow. We'll provide you with a follow-up tomorrow, Alan. Thanks.

THE FACILITATOR HUBERT: Chuck Hubert. Thanks very much. We'll -- we'll anticipate that for tomorrow, and we'll deal with it first thing.

(BRIEF PAUSE)

THE FACILITATOR HUBERT: Chuck Hubert. Final opportunity for -- for questions from -- from today, and if not we'll bid everyone an early adieu.

(BRIEF PAUSE)

THE FACILITATOR HUBERT: And expanding beyond just what was discussed today, just since we have the time, if there are questions that participants felt they would have liked to ask on previous days, Monday through Wednesday, but either did not have the opportunity, or weren't thinking about it at the time, now would be the time to ask any real question on what happened previously. So, if you do, ask it now.

(BRIEF PAUSE)

THE FACILITATOR HUBERT: Excellent. I'll -- I'll take that as people are content for the moment. And so with that, I'd like to close the day. And I -- just one (1) thing I'd like to -- to mention, that there was one (1) under -- undertaking for the caribou question from -- from Anne Gunn. I understand that you -- you may resolve that, or may not resolve that tomorrow, but in any case that undertaking is currently noted by -- in the transcription as Undertaking number 2.

I would like to very much thank people. Alan, thank you. I -- thanks everybody for attending today, and it's great to have you participate, all -- all parties, and De Beers and their consultants, and -- and Wendy and the sound people. It takes everybody here to make this a successful event, so thanks very much.

And nine o'clock tomorrow, we will see you all again. So, bye for now.

--- Upon adjourning at 4:06 p.m.

Certified correct,

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Wendy Warnock, Ms.