

Review Comment Table

Board:	MVLWB												
Review Item:	De Beers - Gahcho Kue - Groundwater Monitoring Program-Version 2 (MV2005L2-0015)												
File(s):	MV2005L2-0015												
Proponent:	De Beers Canada Inc - Gahcho Kue												
Document(s):	Groundwater Monitoring Program - Version 2 (1 MB)												
Item For Review Distributed On:	Mar 17 at 17:54 Distribution List Mar 17 at 17:54 Distribution List												
Reviewer Comments Due By:	Apr 29, 2015												
Proponent Responses Due By:	May 6, 2015												
Item Description:	<p>March 22 - Please be advised that due to various other reviewer deadlines at this time, the reviewer comment deadline has been extended to April 29 and the response deadline has been extended to May 6.</p> <p>March 17 - In accordance with the requirements of Water Licence MV2005L2-0015, De Beers Canada Inc. has submitted their updated Groundwater Monitoring Program to the Mackenzie Valley Land and Water Board.</p> <p>Please submit comments using the Online Review System by downloading the excel comment table or using the "add comment" button.</p> <p>If you have any questions or comments regarding this Program or on using the Online Review System, please contact Angela Love at 867-766-7456 or angela.love@mvlwb.com.</p>												
General Reviewer Information:	<p>In addition to the email distribution list, faxes were sent to the Akaitcho fax distribution list:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;">Fort Resolution Métis Council</td> <td style="width: 25%;">Trudy King</td> <td style="width: 25%;"></td> <td style="width: 25%;">(867)394-3322; Fieldworker.frmc53@northwestel.net;</td> </tr> <tr> <td>Hay River Metis Council</td> <td>Wally Shuman</td> <td>President</td> <td>(867)874-4472; hrrmc@northwestel.net;</td> </tr> <tr> <td>NWT Metis Nation</td> <td>Tim Heron</td> <td>NWTMN IMA Coordinator</td> <td>(867)872-2772; rcc.nwtmn@northwestel.net;</td> </tr> </table>	Fort Resolution Métis Council	Trudy King		(867)394-3322; Fieldworker.frmc53@northwestel.net ;	Hay River Metis Council	Wally Shuman	President	(867)874-4472; hrrmc@northwestel.net ;	NWT Metis Nation	Tim Heron	NWTMN IMA Coordinator	(867)872-2772; rcc.nwtmn@northwestel.net ;
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NWT Metis Nation	Tim Heron	NWTMN IMA Coordinator	(867)872-2772; rcc.nwtmn@northwestel.net ;										
Contact Information:	Angela Love 867-766-7456 Jen Potten 867-766-7468 Marc Casas 867-766-7466												

Comment Summary

GNWT - Environment and Natural Resources: Patrick Clancy			
ID	Topic	Reviewer Comment/Recommendation	Proponent Response
6	General File	<p>Comment (doc) ENR Comments and Recommendations</p> <p>Recommendation GENERALFILE</p>	
1	Topic 1: Open Pit Mine Water Quantity	<p>Comment Comment(s): Section 4.1.1.1 identifies that "Significant trends in groundwater inflow that are greater than projected inflow rates will trigger a re-evaluation of mine water quantity management as discussed in Section 4.1.5 .". ENR notes that there is no Section 4.1.5 in this report. However, a discussion on how greater than projected groundwater inflows would impact the overall water management strategy for the site would be helpful, and could also be used to provide a rationale for the proposed low action level associated with groundwater inflows.</p> <p>Recommendation Recommendation(s): 1) ENR recommends the document should include a discussion regarding how greater than impacted groundwater inflows could influence minewater management.</p>	<p>May 6: Greater than predicted groundwater inflows to the pits will mean that potentially higher volumes of water will need to be managed within the controlled area (e.g., in the water management pond). High level contingency options regarding managing potentially higher volumes of water in the water management pond are provided in Section 2.2.5 of the Construction Water Management Plan; detailed contingency planning regarding operational water management with respect to groundwater pit inflows, will be presented as part of the Operational Water Management Plan, which will be submitted to the MVLWB for approval at least sixty (60) days prior to the commencement of milling. The current water management system including both the water storage areas and mined-out pits can provide an extra water storage capacity over the mine operation and have a minimum of 1.8 Mm³ extra water storage capacity at the end of mine operation (see Figure 13 of De Beers 2013). In addition, during mine operation, at least 1.0 m freeboard will be maintained between the top of water retaining elements (liners or till core) and the design maximum water level for each of the components of the water management system. Therefore, additional water can be temporarily stored within the 1.0 m freeboard zone in the system. Based on the currently predicted quantity of groundwater inflow into open pits, an increase of 20% of the pit inflow over the entire mine operation period will require an additional storage capacity of 1.6 Mm³, which is smaller than the extra storage capacity of 1.8 Mm³ in the water management system provided at the end of mine operation. In short, the current water management system can accommodate up to 20% of the pit inflow increase over the entire mine operation period. The list of potential adaptive management responses to the triggering of a low action level concerning greater than expected groundwater inflows outlined in the Construction Water Management</p>

			<p>Plan Version 5 (De Beers 2015, Section 2.2.5) include: increasing the frequency of monitoring of flows and chemistry; investigating site conditions to verify the source of the issue; investigating other factors that may be contributing to higher than projected pit inflows or groundwater quality; re-calibrating the model used for the EIS prediction and update the water quality model as necessary to evaluate the impact; updating the water balance model to evaluate the potential impact on the water management plan; revising the mine water management plan, if necessary; developing detailed corrective actions, if necessary, in accordance with associated environment risk; and reporting action level triggers and response to the MVLWB. The Groundwater Monitoring Program will be amended such that reference to Section 4.1.5 will be removed, and reference to Section 2.2.5 of the Construction Water Management Plan will be added. Reference: De Beers (De Beers Canada Inc.). 2013. Gahcho Kué Mine Draft Water Management Plan, November 2013. Submitted to the Mackenzie Valley Land and Water Board, Yellowknife, NWT. November 2013. De Beers. 2015. Construction Water Management Plan - Version 5. Gahcho Kué Mine. Submitted to the Mackenzie Valley Land and Water Board, Yellowknife, NWT. March 2015.</p>
2	<p>Topic 2: Low Action Level “ Groundwater Inflow Quantity</p>	<p>Comment Comment(s): The Low Action Level for groundwater inflow quantity will be triggered if monthly average inflow quantities are 20% higher than predicted monthly averages over a 6 month period. Exceeding predictions by 20% over six months appears high for a low action level. The rationale for selection of the magnitude (20%) and time period (6 months) appears to be that these flows would impact the long term ability of DeBeers to store water in the Water Management Pond in the long term. However, a detailed rationale is not provided. This discussion could be included in a Section 4.1.5 as referenced above.</p> <p>Recommendation Recommendation(s): 1) ENR recommends DeBeers provide additional information supporting the selection of the low action level criteria</p>	<p>May 6: Agreed. Additional explanation of the rationale for the groundwater inflow quantity low action level will be added to the Groundwater Management Program, Section 7, as described below. Throughout mining of the pits, it is expected that there will be some scatter (variability) in the measured groundwater inflow due to local variations in hydraulic conductivity, operational changes, and weather conditions (see Groundwater Monitoring Program, Version 2, Section 7). In particular, seasonal variations in water to be managed within the open pit are expected due to surface water inputs. For example, increased minewater will be observed during the freshet. Observation of pit inflows over a longer period will allow for discernment of the groundwater component of minewater, assessment of meaningful trends in this component and evaluation against model predictions. The proposed low action trigger magnitude of 20% is based on the additional storage capacity available within the current water management system as described in the</p>

		<p>for groundwater inflow.</p>	<p>response to GNWT 1. The duration of six months is based on observed seasonal variations in pit water at Diavik during the early stages of operations (Golder 2004), and would apply to groundwater inflows to individual pits only during their development. Action levels for pit water on a site wide basis are described in the Construction Water Management Plan (De Beers 2015) and will be triggered if pit inflows quantity is 10% greater than predicted for consecutive measurements over a two-month period. Section 7, which describes the Low Action Levels, and the rationale behind their selection, will be amended to clarify this point. Reference: De Beers (De Beers Canada Inc.). 2015. Construction Water Management Plan - Version 5. Gahcho Kué Mine. Submitted to the Mackenzie Valley Land and Water Board, Yellowknife, NWT. March 2015. Golder (Golder Associates Ltd.). 2004. Diavik Hydrogeologic Numerical Model December 2004 Re Calibration. Submitted to Diavik Diamond Mines Inc.</p>
3	<p>Topic 3: Low Action Level Exceedance and Model Recalibration “ Groundwater Inflow Quantity</p>	<p>Comment Comment(s): Section 7 identifies that the numerical hydrogeological model will be recalibrated if it is discernable that the increased groundwater inflows are a long term effect. No discussion is provided regarding how a long term effect will be identified. Recommendation Recommendation(s): 1) ENR recommends DeBeers include a discussion regarding how long term effects will be identified.</p>	<p>May 6: Agreed. Additional discussion regarding the rationale for how long term effects will be identified will be added to the Groundwater Management Program, Section 7, as described below. A low action level would be triggered if groundwater inflow quantity to an individual pit, based on a monthly average of inflow over six consecutive months (amounting to six average values), is 20% higher than predicted or if the site-wide total inflow rate is 10% higher than predicted over a two month interval (De Beers 2015, Section 2.2.5). Identification of a potential long term effect would be based on a detailed examination of the groundwater data to assess the potential causes of greater than expected groundwater quantity as stated in Table 5. If the higher than predicted flows could be correlated to a short term effect such as freshet, transient drainage of a high storage feature, or dewatering of lakebed sediments, then no further action would be required. However, if the higher than predicted flows could not be correlated to a short term effect, then the effect would be considered to be potentially long term. As a consequence, an update and possibly re-calibration of the numerical hydrogeological model would be required to investigate, and confirm or refute any potential long term effects. Confirmation of a long-term impact would result in adaptive management</p>

			<p>actions in accordance with the environmental risk. Reference: De Beers (De Beers Canada Inc.). 2015. Construction Water Management Plan - Version 5. Gahcho Kué Mine. Submitted to the Mackenzie Valley Land and Water Board, Yellowknife, NWT. March 2015.</p>
4	<p>Topic 4: Low Action Level “ Groundwater Inflow Quality</p>	<p>Comment Comment(s): The Low Action Level for groundwater quality will be triggered if concentrations of parameters of concern are greater than 10% of the predicted concentrations, for a period greater than 2 months. The plan does not specify whether these concentrations would be averages or maximums. The rationale for selection of the magnitude (10%) and time period (2 months) is not provided. This discussion could be included in a Section 4.1.5 referenced above.</p> <p>Recommendation Recommendation(s): 1) ENR recommends DeBeers provide additional information supporting the selection of the low action level criteria for groundwater quality.</p>	<p>May 6: A low action level specific to groundwater quality is not needed as discrepancies between predicted and observed groundwater quality are only relevant if these discrepancies adversely impact the water quality in the water management pond to limit its release to the receiving environment. Monitoring of discharge from the water management pond for compliance with the Effluent Quality Criteria will take place as described in the Surveillance Network Program defined in Annex A of the Water License (MV2005L2-0015). If Effluent Quality Criteria are not met at the discharge point, a response would be the investigation into the quality of the sources of water transferred to the water management pond. The low action level specific to groundwater quality will be removed from Table 5, however De Beers suggest that groundwater quality could be incorporated into a moderate action level, which would be developed if Effluent Quality Criteria were not met at the discharge point during operational discharge or if a low action level for groundwater quantity were triggered. For example, if a low action level for groundwater quantity was triggered, and the greater than predicted inflows could not be explained by a transient short term effect, then the evaluation of groundwater quality would be considered. This moderate action level for groundwater quality could be based on monthly average concentrations of as parameters of concern in sump discharge to individual pits over two months, as some scatter in the water quality of the sump discharge is expected due to seasonal variation, transient drainage, and variations in the rate of mining and predictions in groundwater inflow quality presented in the 2010 EIS (De Beers 2010, Section 11.6) correspond to average concentrations. The magnitude of measured average concentrations being 10% greater than predicted concentrations is considered appropriate to allow for discernment of variability in the water quality of sump discharge that merits further investigation. Additional information regarding the rationale for selection</p>

			of the action level criteria for groundwater quality will be added to the Groundwater Management Program, Section 7, as described below. Reference: De Beers (De Beers Canada Inc.). 2010. Environmental Impact Statement for the Gahcho Kué Project. Volumes 1, 2, 3a, 3b, 4, 5, 6a, 6b, 7 and Annexes A through N. Submitted to Mackenzie Valley Environmental Impact Review Board. December 2010.
5	Topic 5: Low Action Level Exceedance and Model Recalibration “Groundwater Inflow Quality	<p>Comment Comment(s): Section 7 identifies that the numerical hydrogeological model will be recalibrated if it is discernable that the increased groundwater concentrations are a long term effect. No discussion is provided regarding how a long term effect will be identified.</p> <p>Recommendation Recommendation(s): 1) ENR recommends DeBeers include a discussion regarding how long term effects in groundwater quality will be identified.</p>	<p>May 6: Additional discussion regarding how long term effects in groundwater quality will be identified will be added to the Groundwater Management Program, Section 7, as described below. A potential long-term effect would be identified through the on-going monitoring of the groundwater chemistry through the Surveillance Network Program stations associated with the pit sumps, and would be based on a detailed examination of the groundwater quality data to assess the potential causes of greater than predicted groundwater quality. If the higher than predicted quality is not found to be correlated to a short-term transient effect than the effect could potentially be long-term, and an update of the groundwater model would be needed to confirm this.</p>

MVLWB: Lindsey Cymbalisky

ID	Topic	Reviewer Comment/Recommendation	Proponent Response
1	Section 8: Reporting	<p>Comment This section (and other sections in this Plan) references an annual groundwater monitoring report, but it is unclear whether this submission will be part of the Annual Water Licence Report.</p> <p>Recommendation Please indicate whether the annual groundwater monitoring report will be submitted as part of, or attached to, the Annual Water Licence Report to meet the requirements of Schedule 1, Item 1(g) of WL MV2005L2-0015). If the annual groundwater monitoring report will be submitted separately, please indicate the annual submission date for this report.</p>	<p>May 6: De Beers will report on groundwater monitoring as part of the Water Licence Annual Report as per Schedule 1, Item 1(g) of WL MV2005L2-0015. The references to annual reporting within the Groundwater Monitoring Program will be amended to reflect this.</p>
2	Section 4.1.4: Groundwater Model Updates -	<p>Comment In this section, De Beers states that the frequency of monitoring events could be decreased if observed values or changes are less than predicted.</p>	<p>May 6: Agreed. The Groundwater Monitoring Program will be amended as per the recommendation.</p>

	Monitoring Frequency	Recommendation Please note that monitoring frequencies for the open pits are described in the SNP attached to WL MV2005L2-0015. Changes to these frequencies must be approved by the Board.	
3	Section 5: Groundwater Management Section 7: Action Levels	Comment Both of these sections make only vague references to potential adaptive management actions/responses (other than data evaluation and potential model recalibration) that could be taken if groundwater quality and quantity values are higher than predicted. Although the full details of management responses may not be available at this time, general contingency options should be developed in advance. Board staff assume that water management contingencies will be described in the Operational Water Management Plan, which has not yet been submitted, but this link is not clearly made in this Plan. Recommendation This Plan should indicate where corrective/adaptive management actions will be described, if not in this Plan. If these actions will be described in the Operational Water Management Plan, this should be clearly indicated.	May 6: The management of groundwater pit inflows if higher than expected, including a list of contingencies for greater than predicted inflows of groundwater, is addressed within the Construction Water Management Plan Version 5 (De Beers 2015, Section 2.2.5). Detailed contingency planning regarding operational water management, with respect to groundwater pit inflows, will be presented as part of the Operational Water Management Plan, which will be submitted to the MVLWB for approval at least sixty (60) days prior to the commencement of milling. Reference: De Beers. (De Beers Canada Inc.). 2015. Construction Water Management Plan - Version 5. Gahcho Kué Mine. Submitted to the Mackenzie Valley Land and Water Board, Yellowknife, NWT. March 2015.
4	Section 7: Action Levels	Comment On page 31 of this Section, De Beers describes management responses to low action levels for groundwater quantity, including "re-calibration of the numerical hydrogeological model and prediction of revised future inflows, if it is discernable that the discrepancy is a long-term effect". Recommendation How will a long-term effect be discerned?	May 6: Identification of potential long-term effects would be based on a detailed examination of the groundwater data to assess the potential causes of greater than expected groundwater quantity as stated in Table 5. If the higher than predicted flows could be correlated to a short-term effect such as freshet, transient drainage of a high storage feature or dewatering of lakebed sediments than no further action would be needed. However, if the higher than predicted flows could not be correlated to a short-term effect, than the effect could potentially be considered to be long-term, and an update and possibly re-calibration of the numerical hydrogeological model would be required to investigate, and confirm or refute the potential long-term impacts. Confirmation of a long-term impact would result in adaptive management actions in accordance with the environmental risk. The text in Table 5 will be amended as such.
5	Section 7: Action	Comment On page 31 of this Section, De Beers states that action levels	May 6: A low action level for groundwater quality is not being proposed. The primary

	Levels	<p>specific to groundwater quality are not needed, and goes on to say that groundwater quality data will be evaluated if groundwater is considered to be a possible source of exceedances of EQC at the discharge to the Water Management Pond. A low action level for groundwater quality is, however, described in Table 5.</p> <p>Recommendation Please clarify whether a low action level for groundwater quality is being proposed.</p>	<p>driver for load to the water management plan is groundwater inflow quantity, and as such is appropriate for use as a low level trigger. This does not mean that groundwater quality is being disregarded; the groundwater quality action level provided in Table 5 could represent a potential moderate action level that would be developed if Effluent Quality Criteria were not met at the discharge point during operational discharge or as one of the responses to a low action level for groundwater quantity being triggered. For example, if low action level for groundwater quantity were triggered, and the greater than predicted inflows could not be correlated to a transient short term effect, than the moderate action level for groundwater quality would be developed. Section 7 and Table 5 of the Groundwater Monitoring Program will be amended to reflect this.</p>
6	Section 7: Action Levels - Table 5	<p>Comment In this Table, it is unclear whether the action levels are based on the water quantity and quality from each pit or from the overall outflow from the pits.</p> <p>Recommendation Please clarify the proposed action levels.</p>	<p>May 6: Action levels for groundwater will be based on monitoring results for each individual pit, thereby allowing for identification of trends early in the pit life, and to allow for adaptive management. This point will be clarified in the Groundwater Management Program, Section 7.</p>