Staff Report

Applicant:
De Beers Canada Inc.

Location:
Snap Lake, NT

Application:
MV2011L2-0004 & MV2017D0032

Date Prepared:
June 11, 2018

Meeting Date:
June 20, 2018

Subject:
2018 RECLAIM Financial Security Estimate Report

1. Purpose/Report Summary

The purpose of this Report is to present to the Mackenzie Valley Land and Water Board (MVLWB/the Board) a 2018 RECLAIM Financial Security Estimate (Security Estimate) Report, submitted by De Beers Canada Inc. (De Beers), for the Snap Lake Mine, to fulfill Part C, condition 3 of Water Licence (Licence) MV2011L2-0004 and Condition 50 of Land Use Permit (Permit) MV2017D0032.

2. Background

- January 30, 2018 – Security Estimate Report received;
- February 1, 2018 – Review commenced;
- March 6, 2018 – Reviewer comments and recommendations due and received;
- March 13, 2018 – Responses due and received;
- April 16, 2018 – De Beers submits an updated 2018 Security Estimate Report, version 2;
- May 14, 2018 – De Beers submits an Amendment Application for Permit MV2017D0032, which includes amending the amount of security; and the updated Security Estimate Report, version 2, is distributed for review;
- May 31, 2018 – Reviewer comments and recommendations due and received (updated Security Estimate Report, version 2);
- June 4, 2018 – De Beers submits an updated 2018 Security Estimate Report, version 3;
- June 6, 2018 – Responses received;
- June 20, 2018 – Security Estimates (versions 1, 2, and 3) presented to the Board for decision; and

3. Discussion

The Government of the Northwest Territories (GNWT) currently holds a $39,066,247.00 in reclamation liability security for the Snap Lake Mine under Water Licence MV2011L2-0004, and an
additional $21,335,671.00 in reclamation liability security under Permit MV2017D0032; totaling $60,401,918.00 (attached).

Part C, condition 3 of Licence MV2011L2-0004 states the following:

Upon receiving a request from the Board, the Licensee shall submit to the Board a revised mine reclamation liability estimate utilizing the current version of RECLAIM or another method acceptable to the Board.

On February 18, 2016, the Board directed De Beers to submit an updated reclamation liability estimate report by January 30, 2017 (attached). At the request of De Beers, the Board granted a 1-year extension to this deadline on September 23, 2016 (attached).


4. Comments

Licence MV2011L2-0004

Part B, condition 11 of Licence MV2011L2-0004 states:

The Schedules, the Surveillance Network Program, and any compliance dates specified in this Licence may be changed at the discretion of the Board. If any date for the submission of a plan, report, or program falls on a weekend or holiday, the plan, report, or program shall be submitted on the following business day.

In addition, Part C, conditions 4 through 6 state the following:

4. The Licensee shall maintain such further or other security amounts as may be required by the Board based on estimates of current mine reclamation liability in accordance with Part C, item 3, or based on such other information as may be available to the Board.

5. Reductions to the security deposit may be approved by the Board based on estimates of current mine reclamation liability in accordance with Part C, item 3 or based on such other information as may be available to the Board.

6. If the amount of the security deposit is revised by the Board as described under Part C, item 4, the Licensee shall post the revised amount with the Minister within ninety (90) days of the Board giving notice of the revised amount.

Therefore, the Board can update (increase or decrease) the amount of security outlined in Schedule 2, condition 1 of Licence MV2011L2-0004 without an amendment to the Type A Licence.

Permit MV2017D0032

Unlike Licence MV2011L2-0004, the Board cannot amend the security condition in Permit MV2017D0032 unless De Beers submits an amendment application requesting this change to Condition 50; this is established under subsection 26(2) of the Mackenzie Valley Land Use Regulations.

On May 14, 2018, De Beers submitted an amendment application for Permit MV2017D0032, which includes the request to increase the security required from $21,335,671.00 to the amount indicated in their 2018 Security Estimate Report. This amendment application will be presented to the Board
in a separate Board Package following this presentation. The Board can address this increase in land liability security at that time.

5. Reviewer Comments

By March 6, 2018, comments and recommendations on the 2018 Security Estimate Report, version 1 (attached) were received from the Government of the Northwest Territories – Environment and Natural Resources (GNWT-ENR).

De Beers responded on March 13, 2018. The Review Summary and Attachments (attached) presents the concerns identified through the review of the security estimate.

Final Closure and Reclamation Plan

Many of GNWT-ENR’s comments and recommendations requested additional details to verify the estimate values provided by De Beers. De Beers responded to these comments indicating that some details are still unknown and will be determined during the closure process and as part of the Final Closure and Reclamation Plan submission. Therefore, the identified uncertainties remaining in the current reclamation security estimate should be answered and addressed within the next 2 years. GNWT-ENR stated that, “In general De Beers responses to ENR comments, based on review of the January 30, 2018 Financial Security Estimate report [version 1], are reasonable in that most comments (e.g. water treatment types and duration and post-closure maintenance) are to be addressed or updated with submission of the Final Closure and Reclamation Plan.”

Security Estimate Report, versions 2 and 3

De Beers responded to some of GNWT-ENR comments by submitting version 2 of the 2018 Financial Security Report on April 16, 2018 (attached). This submission was included as part of the Permit MV2017D0032 amendment application review. Some of the changes provided clarity on where certain values came from and did not affect the amount of the estimate; however, the change made in version 2 to address GNWT-ENR comment ID-18 regarding mobilization and demobilization did alter the amount in the security estimate compared with that in version 1.

On May 14, 2018, version 2 of the 2018 Security Estimate Report was distributed for review. In response to the version 2 review, GNWT-ENR identified they did not agree with how De Beers updated version 2 in response to its previous comment regarding mobilization and demobilization (ID-18; attached). In version 2, De Beers removed the “loads/machine” column from the calculation, rather than updating the values to be more accurate as requested by GNWT-ENR. Thus, on June 4, 2018, De Beers submitted version 3 of the 2018 Security Estimate Report (attached). Board staff have reviewed version 3 and note that the Mobilization/Demobilization table values for ‘loads per equipment’ have been included, and that portion of the table has been revised by De Beers.

Also, in response to the version 2 review, the GNWT-Lands Inspector requested clarity on some of the information presented in the 2018 Security Estimate Report, version 2. Board staff are of the opinion that De Beers’ responses adequately address the Inspector’s concerns.

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1 The Final Closure and Reclamation Plan is anticipated to be submitted with their new water licence application for final closure. Licence MV2011L2-0004 expires June 13, 2020.

2 GNWT-ENR Comment ID’s: 3, 4, 6, 7, and 18.
6. Security

Table 1 below compares De Beers’ Summary Table from the 2018 Security Estimate Report, version 1 (January 30, 2018), version 2 (April 16, 2018), and version 3 (June 4, 2018). The differences for land and water liabilities between report versions are highlighted in green and blue, respectively.

Table 1: Breakdown of De Beers’ 2018 Security Estimate Report

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<tr>
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<tbody>
<tr>
<td></td>
<td>Land</td>
<td>Water</td>
<td>Land</td>
</tr>
<tr>
<td>Open pit</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Underground mine</td>
<td>$357,643</td>
<td>$0</td>
<td>$357,643</td>
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<tr>
<td>Tailings facility</td>
<td>$6,612,779</td>
<td>$1,085,293</td>
<td>$6,612,779</td>
</tr>
<tr>
<td>Rock pile</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Buildings and equipment</td>
<td>$18,948,846</td>
<td>$75,000</td>
<td>$18,948,846</td>
</tr>
<tr>
<td>Chemicals and contaminated soil management</td>
<td>$2,528,688</td>
<td>$2,528,688</td>
<td>$2,528,688</td>
</tr>
<tr>
<td>Surface &amp; groundwater management</td>
<td>-</td>
<td>$3,543,769</td>
<td>-</td>
</tr>
<tr>
<td>Interim care and maintenance</td>
<td>-</td>
<td>$8,263,107</td>
<td>-</td>
</tr>
<tr>
<td>PERCENT OF SUBTOTAL</td>
<td>65%</td>
<td>35%</td>
<td>65%</td>
</tr>
<tr>
<td>INDIRECT COSTS</td>
<td>Land</td>
<td>Water</td>
<td>Land</td>
</tr>
<tr>
<td>Mobilization/demobilization</td>
<td>$5,994,744</td>
<td>$3,265,391</td>
<td>$5,191,364</td>
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<tr>
<td>Post-closure monitoring and maintenance</td>
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<td>$4,266,033</td>
<td>$7,831,767</td>
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<tr>
<td>Engineering (5%)</td>
<td>$1,422,398</td>
<td>$774,793</td>
<td>$1,422,398</td>
</tr>
<tr>
<td>Project management (5%)</td>
<td>$1,422,398</td>
<td>$774,793</td>
<td>$1,422,398</td>
</tr>
<tr>
<td>Health and safety plans/monitoring &amp; QA/QC(1%)</td>
<td>$284,480</td>
<td>$154,959</td>
<td>$284,480</td>
</tr>
<tr>
<td>Bonding/insurance (1%)</td>
<td>$284,480</td>
<td>$154,959</td>
<td>$284,480</td>
</tr>
<tr>
<td>Contingency (20%)</td>
<td>$5,689,591</td>
<td>$3,099,171</td>
<td>$5,689,591</td>
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<tr>
<td>Market price factor adjustment (0%)</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
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<tr>
<td>SUBTOTAL: Indirect Costs</td>
<td>$22,929,857</td>
<td>$12,490,099</td>
<td>$22,126,477</td>
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<tr>
<td>GRAND TOTAL COSTS</td>
<td>$79,363,769</td>
<td>$78,122,780</td>
<td>$78,963,088</td>
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</tbody>
</table>

As portrayed in Table 1, the only difference between the security estimates presented in all 3 versions of De Beers’ 2018 Security Estimate Reports is the Mobilization/demobilization line item. The resulting total costs of all three estimates are relatively the same.

As noted above in Section 3 of this staff report (Discussion), the GNWT currently holds a grand total of $60,401,918.00 for the project. De Beers has suggested that the Licence security be reduced by approximately $11M, and Permit security be increased by approximately $30M. Therefore, overall, De Beers has suggested an increase in security of approximately $18.6M for the Snap Lake Mine.

It is important to note that the mine is no longer in an operation or production phase, which greatly contributes to the decrease in reclamation liability for the water portion of the estimate. RECLAIM has also been updated since the version used to calculate the 2012 estimate; RECLAIM 7.0 was used by De Beers for the 2018 estimates.

Board staff suggest that the amounts proposed by De Beers in version 3 of the 2018 Security Estimate are likely the most accurate as they have incorporated two rounds of review comments and recommendations. If the Board revises the amount of security required, then these amounts would be reflected in Schedule 2 and Annex 3 attached to Licence MV2011L2-0004. No changes were made to the body of the Licence. The revised amount must be posted to satisfy subsection 35(1) of the Waters Act, which outlines that the form of the security shall be acceptable to the Minister, as well as Part C, condition 4 of the Licence. As per Part C, condition 6, the revised amount shall be posted with the within 90 days of the Board’s decision.

7. Conclusion
Board staff conclude that De Beers is requesting to reduce the reclamation security required by Licence MV2011L2-0004.

Further information was provided in responses to reviewer comments. Board staff conclude there are no outstanding concerns with this submission.

Board staff remind the Board that revision of the land liability security amount in Permit MV2017D0032 will be presented to the Board following this presentation.

8. Recommendation
Board staff recommend the Board make a motion to approve the revision of Schedule 2, condition 1 of Water Licence MV2011L2-0004.

Draft revised Licence conditions and Reasons for Decision are attached.

9. Attachments
- February 18, 2016 – Board Decision Letter
- September 23, 2016 – Board Decision Letter
- Confirmation of Security held under MV2011L2-0004
- Confirmation of Security held under Permit MV2017D0032
- De Beers’ 2018 Financial Security Estimate, Version 1
• Draft revised Licence MV2011L2-0004
• Review Summary and Attachments – Version 1 and 2
• Draft Reasons for Decision
• Draft Decision Letter from the Board

Respectfully submitted,

[Signature]

Kierney Leach
Technical Regulatory Specialist
## Review Comment Table

<table>
<thead>
<tr>
<th>Board:</th>
<th>MVLWB</th>
</tr>
</thead>
</table>
| File(s): | MV2011L2-0004  
MV2017D0032 |
| Proponent: | De Beers Canada Inc. - Snap Lake |
| Document(s): | 2018 Financial Security Estimate / RECLAIM (29MB) |
| Item For Review Distributed On: | Feb 1 at 15:37 Distribution List |
| Reviewer Comments Due By: | Mar 6, 2018 |
| Proponent Responses Due By: | Mar 13, 2018 |

### Item Description:

De Beers Canada Inc. (De Beers) Snap Lake submitted a revised financial security estimate using RECLAIM on January 30, 2018 to the Board. This submission is required by Part C, item 3 of Licence MV2011L2-0004.

On August 17, 2016, De Beers submitted a request to extend the submission deadline of the Interim Closure and Reclamation Plan (ICRP) Version 4. On September 23, 2016 the Board approved an extension to January 30, 2018, and also decided to extend the submission deadline for the revised reclamation security estimate to January 30, 2018.

Reviewers are invited to submit questions, comments, and recommendations on this submission by **Tuesday March 6, 2018 at 5pm MST**.

All documents that have been uploaded to this review are also available on our public registry. If you have any questions or comments regarding this submission or using the Online Review System, please contact Kierney Leach at 867-766-7470 or kleach@mvlwb.com.

### General Reviewer Information:

In addition to the email distribution list, the following organizations received review materials by fax:

- Fort Resolution Métis Council - Trudy King (867) 394-3322
- Hay River Metis Council - Trevor Beck, President (867) 874-4472
- NWT Metis Nation - Tim Heron, NWTMN IMA Coordinator (867) 872-3586
## Contact Information:
Jacqueline Ho 867-766-7465  
Jen Potten 867-766-7468  
Kierney Leach 867-766-7470

## Comment Summary

### GNWT - ENR: Central Email GNWT

<table>
<thead>
<tr>
<th>ID</th>
<th>Topic</th>
<th>Reviewer Comment/Recommendation</th>
<th>Proponent Response</th>
<th>Board Staff Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>General File</td>
<td><strong>Comment</strong> (doc) ENR Letter with Comments and Recommendations and Attached Brodie Consulting Memo <strong>Recommendation</strong></td>
<td></td>
<td>Noted.</td>
</tr>
<tr>
<td>1</td>
<td>Topic 1: General - Cover letter &amp; Crediting System</td>
<td><strong>Comment</strong> In reference to Environmental Agreement (the Agreement) security held with the GNWT-ENR, De Beers states in the cover letter expectations for a consistent process approach when allocating the entire security for the Mine, as with the last RECLAIM revision. Two types of security are provided for under the Agreement. As outlined in Clause 12.1(a) of the Agreement, the Security Deposit and the Additional Security Deposit are to be held by the Minister of Environment and Natural Resources &quot;.as security for the performance by DBCMI of its closure and reclamation obligations under the Water Licence and Land Leases, any</td>
<td><strong>Mar 13: Noted.</strong></td>
<td>Noted.</td>
</tr>
<tr>
<td>2</td>
<td><strong>Topic 2:</strong> General “Cover Letter &amp; Additional Security (ADS)”</td>
<td><strong>Comment</strong> De Beers acknowledges that a portion of the total security under the Agreement is held with the GNWT-ENR. The amount held by the Minister is $20,000,000 for performance obligations that are not covered by the security deposit, which as stated, is credited against the relevant licenses, permits or leases. <strong>Recommendation 1)</strong> ENR holds security for obligations under the Agreement, such as wildlife and air quality monitoring, and that we</td>
<td><strong>Mar 13:</strong> De Beers’ estimate is the quantum of the total security, of which a portion is covered under the Environmental Agreement and the remainder under the water licence/land use permit.</td>
<td><strong>Noted.</strong></td>
</tr>
</tbody>
</table>
believe that those items should be removed from RECLAIM to avoid double bonding. While it is the GNWT’s position that security for air and wildlife should be held under the Agreement, the GNWT is providing comments on those topics for the Board’s consideration.

<table>
<thead>
<tr>
<th>Topic 3: Wildlife and Wildlife Habitat Protection Plans (WWHPPs)</th>
<th><strong>Comment</strong> The Updated Financial Security Estimate notes on page A-19, that the Wildlife Effects Monitoring Program (WEMP) will be reduced to monitoring on a five year cycle following the end of mining. There is no mention of the Wildlife and Wildlife Habitat Protection Monitoring Program (WWHPP) that is currently undertaken by De Beers. <strong>Recommendation</strong> 1) Please clarify De Beers’ proposed monitoring schedule for the WWHPP.</th>
<th><strong>Mar 13:</strong> The WWHPP will be conducted concurrently with the WEMP. The RECLAIM report will be updated to clarify this aspect.</th>
<th>Acceptable response. This has been updated in version 2 and version 3 of the 2018 Security Estimate Report submitted on April 16, 2018 and June 4, 2018, respectively.</th>
</tr>
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<tbody>
<tr>
<td>Topic 4: Cost Estimates for Combined Aquatic and Wildlife Effects</td>
<td><strong>Comment</strong> Table A.9 page A-21 and 22 displays aquatic and wildlife effects monitoring programs as a combined cost item. <strong>Recommendation</strong> 1) Wildlife effects monitoring would be better reflected as a single line item separated from that of aquatics in order to assess what costs are being assigned to wildlife effects monitoring. More information, such as which valued components are being monitored and the frequency and method of monitoring, are required in order to assess whether De Beers’ cost estimate for</td>
<td><strong>Mar 13:</strong> The RECLAIM report will be updated to separate out the aquatic and wildlife effects into separate line items. The monitoring programs for final closure will be updated with the final closure and reclamation plan.</td>
<td>Acceptable response. This has been updated in version 2 and version 3 of the 2018 Security Estimate Report submitted on April 16, 2018 and June 4, 2018, respectively.</td>
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<td>Topic 5: Environmental Agreement Monitoring &amp; RECLAIM Security Alignment</td>
<td><strong>Comment</strong> While the Interim Closure and Reclamation Plan outlines some monitoring schedules it is important for De Beers to also consider requirements under the Agreement when proposing new monitoring schedules. Clause 6.3(d) requires De Beers to design an Air Quality and Emissions Management Plan in consultation with Environment Canada, and the GNWT, and for the plan to be reviewed with Environment Canada, the GNWT and SLEMA if there is a major change in infrastructure or emission quantity/quality. Likewise, Clause 6.3(g) requires consultation with the GNWT and SLEMA when developing a Wildlife Monitoring Plan. The GNWT takes this to mean that consultation is required when deviating from the current Air Quality and Emissions Monitoring and Management Plan, WEMP and WWHPP monitoring programs. In addition, the Agreement also identifies what components need to be monitored for air and wildlife. <strong>Recommendation</strong> 1) The GNWT would welcome a meeting between De Beers and SLEMA to discuss the closure and post-closure air and wildlife monitoring requirements under the Agreement. Until an agreement between De Beers, GNWT and SLEMA is reached, De Beers will fulfill its requirements of the EA to engage the GNWT and SLEMA when these plans are further developed.</td>
<td><strong>Mar 13:</strong> The monitoring programs for air and wildlife monitoring at final closure will be updated with the final closure and reclamation plan. De Beers will fulfill its requirements of the EA to engage the GNWT and SLEMA when these plans are further developed.</td>
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</tbody>
</table>
reached on the closure and post-closure air and wildlife monitoring frequency it is difficult to assess whether the cost estimates put forward by De Beers in the RECLAIM estimate are accurate.

|   | Topic 6: Cohesion of Table A.9 page A-21 | Comment | This monitoring phases are projected by year. The dates do not appear to be correct. In addition, the phases in this table do not match the phases that are described in Table A.7. For example, Interim Care and Maintenance (ICM) on Table A.9 is a phase that is not described in table A.7 and the ICM phase is described to start in 2029. **Recommendation** 1) Please review and revise the discussed table(s) accordingly for better cohesion of the document. | Mar 13: Table A.9 will be updated include the correct years. | Acceptable response. This has been updated in version 2 and version 3 of the 2018 Security Estimate Report submitted on April 16, 2018 and June 4, 2018, respectively. |
|---|---|---|---|---|
| 7 | Topic 7: Table A.8 Timelines | **Comment** This table includes a progression of timelines, but it would be more effective if the years were recorded. **Recommendation** 1) It is recommended to include the year in which costs are being attributed. | Mar 13: Table A.8 will be updated to include the years. | Acceptable response. This has been updated in version 2 and version 3 of the 2018 Security Estimate Report submitted on April 16, 2018 and June 4, 2018, respectively. |
| 8 | Topic 8: Air Quality Monitoring | **Comment** Page A-19 indicates that "Air quality monitoring will continue at a similar scope to operations during the final reclamation phase, following which it will be reduced to activities completed once each summer, then terminated | Mar 13: Noted, see response to GWNT #5. | Acceptable response. |
following Year 3 post closure". Was this statement made in consideration of the Agreement, which requires air quality monitoring (Clause 6.3(d) and 7.2(a))? Will this include TSP monitoring, as was done during operations and required under the Agreement?

**Recommendation** 1) It is recommended that changes to air quality monitoring, that would be considered a departure from the Agreement, have evidence of support and sign-off by all parties. Can greater clarity on the monitoring (eg. TSP) be provided at this time? Until the parameters and frequency of the closure and post-closure air monitoring is agreed to by the GNWT and SLEMA, as required by the Agreement, it is difficult to assess whether the cost estimates put forward by De Beers in the RECLAIM estimate are accurate.

<table>
<thead>
<tr>
<th>Topic 9: Scaling Approach for Cost Estimates</th>
<th>Comment</th>
<th>Mar 13: Noted. The monitoring programs for final closure will be updated with the final closure and reclamation plan.</th>
<th>Acceptable response</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>The scaling factor takes into account several things, including reductions in monitoring requirements that were strictly related to operations. Without updates to monitoring plans, it is very difficult to determine if these estimates (which give an indication on the approach to monitoring) are sufficient. <strong>Recommendation</strong> 1) It is recommended that approval of the security update is re-evaluated as additional information is available</td>
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| 10 | ENR notes that the current estimate is based upon assumptions made prior to the decision to proceed with the closure of the Snap Lake Mine. As such, information remains outstanding regarding several important closure components such as: o Updated water quality models that consider the North Pile thermal predictions, geochemistry and weathering of processed kimberlite; o Updated thermal monitoring and predicted time for the North Pile to freeze; o Final Closure Plan for the North Pile; o Approved closure criteria for seepage and runoff; o Reclamation research, which includes vegetation trials that have only just gotten underway (De Beers, 2017b) as well as approval for what is being proposed; o Assessments to support pumping of surface water and or water treatment residuals underground and for how long; and o Monitoring and maintenance requirements following active closure, for a transition period, and post-closure. ENR expects that these topics will become better understood as the Final Closure and Reclamation Plan is developed for the site. **Recommendation** 1) ENR recommends that a thorough review of the security be
undertaken with submission of the Final Closure Plan.

| 11 | Topic 11: Water Management “Pumping to Underground | **Comment** Within the Mine Water Management Plan De Beers describes the option to pump poor quality water from the surface that has interacted with mine surface infrastructure either directly underground, or through the water treatment system with process residuals pumped underground. De Beers has indicated that: "Due to the nature of the Snap Lake Mine Underground, the upper levels of the mine will be buffered from turbulent flow (limited to seasonal discharge) associated with the pumping of surface water underground allowing for the stabilization of the chemocline." ENR is not aware whether De Beers has conducted any studies such as hydrogeological assessments or stratification modelling to support the plan. **Recommendation** 1) ENR recommends that De Beers provide any reports available of hydrogeological assessments and stratification modelling to support the plan. | **Mar 13:** This type of analysis has not been completed. **Mar 13:** As per De Beers Response to Comments ECMP v2 : De Beers removed contaminated materials from the underground prior to commencing flooding, which ensured that the surface and groundwater are not contaminated - this was verified by the GNWT Inspector during bi-weekly inspections of the underground. The estimated volume of surface waters to manage each year is approximately 400,000 m³. This water is expected to have high TDS levels and to have a similar chemical signature as the underground mine water encountered during mining operations. The chemical composition and nature of connate water at Snap Lake was the subject of EA1314-02 requiring De Beers to treat the deep connate water and develop EQCs and SSWQOs that are protective of Snap Lake. De Beers notes that the surface water can be dealt with in one of three ways: 1. Discharged to Snap Lake if it meets the EQC’s 2. Discharged underground if it does not meet the EQC’s 3. Treated and discharged to Snap Lake and with process residuals being discharged underground. De Beers expects approximately 30-50% of the surface waters will be discharged underground. | Acceptable response. |
At the time of the May 2017 overtopping of the fresh-air raise De Beers had pumped a total of approximately 30,000 m³ of water underground to the 5180 level. Upon identification of the overtopping De Beers then ceased pumping underground and obtained emergency discharge authorization from the GNWT Inspector until the cessation of freshet (refer to spill follow up report and subsequent water management updates). De Beers’ authorization did not allow for the recommencement of pumping surface water underground until after the site was stabilized and the emergency authorization discontinued. The overtopping was caused by the initially high pumping rates and faster than expected refilling rate. Upon recommencing with water pumping to the underground it was at a substantially reduced rate of approximately 2000 m³ per day or less. At this rate, the water level in the mine workings remained relatively constant. De Beers will continue to discharge TDS water underground to the 5180 level (consistent with the MVLWB approved water management plan) approximately 260m below the mine entrance. This discharge is into the deeper connate (saline) waters already present at those
<p>| | | |</p>
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<thead>
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<tbody>
<tr>
<td>topic</td>
<td>12</td>
<td>Water Treatment Duration</td>
</tr>
<tr>
<td><strong>Comment</strong></td>
<td>The North Pile collection system will continue to function for some period of time until the surface runoff and any seepage waters are of acceptable quality for direct Mar 13: De Beers recommends this decision be based on the updated water quality predictions (see response to GNWT#13), and not necessary to adjust at this time.</td>
<td>Acceptable response.</td>
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discharge. The security estimate currently includes three years of water treatment: two during Interim Care and Maintenance, and one during Closure. ENR acknowledges that deposition into the North Pile ceased when Snap Lake operations finished and therefore drainage, consolidation and freezing of the pile have been occurring for approximately three years. However, the following factors give rise to uncertainty in the number of years remaining: . Updated thermal monitoring and water quality modelling has not been submitted; . It is not clear what passive treatment is being proposed and how effective it will be (see comment regarding passive treatment); . Criteria for surface water quality have not been finalized. Given the high concentrations of contaminants in the North Pile (De Beers 2017a), and that active closure will result in increased disturbance of the site, it seems optimistic that only three years of water treatment will be required.

Recommendation 1) ENR recommends that the security estimate be adjusted to assume a minimum of five years of water treatment will be required: two years during ICM, two years during active closure, and one year following active closure. Based on the annual cost presented in the security estimate, this would result in
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<th>an increase in direct costs of $1,283,858.</th>
</tr>
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</table>
| 13 | None | **Comment** None  
**Recommendation** 2) ENR recommends that future updates to the security estimate should link the duration of water treatment to water quality predictions based on updated water quality models.  
**Mar 13:** Updated water quality predictions will be completed as part of the final closure and reclamation plan. The updated predictions will build upon the predictions provided to the MVLWB as part of the ECM Plan V.1. Acceptable response.|
| 14 | Topic 13: Water Treatment Costs | **Comment** As part of the Post-EA Information Package, DeBeers provided the report "Preliminary Evaluation of Best Available Technologies Economically Achievable (BATEA) for Reduction of Total Dissolved Solids (TDS) in Effluent at Snap Lake Mine" (DeBeers, 2014). At that time, DeBeers reported that a mini-modular test unit was to be commissioned in 2015 having a capacity of 3,000m3/day with a cost of $0.5M/yr operating expenditure, $1.4M/yr for power, and $1M/year labour for a total of $2.9M/year ($2.65/m3 if assumed this was based on year round operation). The 2018 security estimate includes a provision for water treatment of 235,754m3 at a RECLAIM default unit cost of $2.00/m3 for a subtotal of $471,508. Based on earlier estimates of running the RO plant, combined with the existing water treatment system, this seems low. ENR understands that a microfiltration and reverse osmosis unit will be commissioned for treatment in the coming months and  
**Mar 13:** De Beers notes that the $2/m3 is an appropriate measure to treat water at Snap Lake Mine. The RO/MF treatment system procured for Snap Lake is energy efficient and De Beers has completely re-organized the operational structure of the mine to align with the limited water treatment duration of the operation. Until the mine has conducted a few years of water treatment with the new system it is premature to provide operational data at this time. De Beers will provide an update on treatment costs coupled with the final closure plan and ultimate water treatment solutions. As predicted in 2016 in the ECM V.1 Plan, water quality has improved since operations. De Beers notes that as per the Emergency Discharge Authorization granted in 2017 only a handful of times was the mine out of compliance and could have discharged water directly to the environment outside of these instances. As such, water treatment costs may be limited in duration and Acceptable response. |
refined information regarding efficiency and costs will become available.

**Recommendation**

1) ENR recommends that a detailed breakdown of costs for water treatment be provided. Costs should be based on known costs of operating the existing water treatment system, and estimates of the microfiltration and RO units. Costs should include: labour, power, all chemicals, supplies, analytical testing, and maintenance costs. The security estimate should be revised accordingly. ENR notes that this information is requested for most mines operating in the NWT.

reduce over time. Thus De Beers stands behind the current $2/m³ estimate and notes that this is likely a conservative value that will be reducing annually.

| 15 | Topic 14: Passive Wetland Treatment | **Comment** Section 2.2.5 of the Financial Security Report (Arktis, 2018) indicates that: After three years of active treatment, seepage and contact water will be allowed to flow naturally through a constructed wetland passive treatment system in the area of PS5/IL6 and the WMP before entering into the aquatic environment. Primary costs for water management via constructed wetlands include those related to construction and revegetation. Provisions in the security estimate for a wetland treatment system make reference to the proposed Fortune Minerals Nico Project (Golder, 2014). It is not known what parameters De Beers intends to target with passive treatment, or whether a | **Mar 13:** Noted. The final closure and reclamation plan will further assess the passive treatment requirements for the Mine. | **As outlined by ENR and noted by De Beers, Post-Closure Monitoring and Maintenance costs should be further evaluated upon submission of the Final CRP.** |
similar system to Nico is what is being proposed. It should be noted that AANDC's intervention for the Nico Project (AANDC, 2014) can be summarized as having stated support for passive water treatment, but that considerable more work was required to demonstrate reliable performance. This was in addition to the work that had already completed. It is not known what parameters a constructed wetland semi-passive water treatment system is required for, how effective it will be, and for how many years it will be required (security estimate states “assume 3 years”). Typically, additional active water treatment would be recommended for the security estimate until a semi-passive system can be demonstrated to be effective. However, as the 2018 security estimate includes a provision of nearly $2.5M for a passive system the $2.5M could be allocated to longer term active water treatment if a passive system is not approved. This will have to be reviewed further with submission of a Final Closure and Reclamation Plan that details the proposed semi-passive system.

**Recommendation** 1) ENR recommends that further evaluation of the proposed semi-passive water treatment system and associated costs be carried out with submission of a Final Closure
and Reclamation Plan. If not approved, the security estimate should be updated to reflect longer term active water treatment.

<p>|   | 16 | Topic 15: North Pile “High” Unit Rate | <strong>Comment</strong> De Beers is proposing to use the &quot;high&quot; unit cost from RECLAIM Ver. 7 for estimating the cost to close the North Pile. ENR notes that this unit cost is lower than in previous estimates for Snap Lake, but that the selected rate is from the RECLAIM model, and is higher than the unit cost used at the Diavik and Ekati sites. ENR does not have specific recommendation regarding the selected unit rate at this time, but notes that closure costs for the North Pile should be further evaluated as additional information becomes available through completion of the Final CRP. | <strong>Recommendation</strong> 1) ENR recommends that the closure costs for the North Pile be further evaluated upon submission of the Final CRP. | <strong>Mar 13:</strong> Noted. The final closure Unit reclamation plan will further assess the north rate requirements for the Mine. |
|---|---|---|---|---|
|   | 17 | Topic 16: Post-Closure Management | <strong>Comment</strong> De Beers has included an allowance for 25 years of post-closure monitoring and 15 years of post-closure maintenance. ENR is concerned that the maintenance provisions in the security estimate are insufficient. As noted previously, information on a number of items (such as thermal modelling and time to freezing predictions, seepage quality criteria, vegetation trials, etc.) will become available as the Final | <strong>Mar 13:</strong> Noted. | <strong>As outlined by ENR and noted by De Beers, Post-Closure Monitoring and Maintenance costs should be further evaluated upon submission of the Final CRP.</strong> |</p>
<table>
<thead>
<tr>
<th></th>
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<th>CRP is developed and reclamation research is completed. The post-closure monitoring allowance should be further evaluated as this information becomes available in the Final CRP. This need for further evaluation is acknowledged in the Arktis estimate. <strong>Recommendation</strong> 1) ENR recommends that the Post-Closure Monitoring and Maintenance costs be further evaluated upon submission of the Final CRP.</th>
</tr>
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<tbody>
<tr>
<td>18</td>
<td><strong>Topic 17:</strong> Mobilization</td>
<td><strong>Comment</strong> It appears that there is an error in the calculation of heavy equipment mobilization costs, which may be a carryover from the previous estimate. It appears that the loads per machine may be incorrect (column D) and as a result the calculation of mobilization costs. <strong>Recommendation</strong> 1) ENR recommends that mobilization costs be based on the equipment list provided in the Financial Security Report (Arktis, 2018) as well as known costs for mob/demob that De Beers may have available.</td>
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<td></td>
<td></td>
<td><strong>Mar 13:</strong> Noted. The loads per machine will be updated accordingly.</td>
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<td></td>
<td></td>
<td>Version 2 of the 2018 Security Estimate Report submitted on April 16, 2018 did not properly address ENR’s comment and recommendation. However, De Beers submitted Version 3 of the 2018 Security Estimate Report on June 4, 2018, and Board staff suggest that Version 3 sufficiently incorporates ENR’s comment and recommendation.</td>
</tr>
<tr>
<td>19</td>
<td><strong>Topic 18:</strong> Brodie Consulting Memo â€“ March 6, 2018 - Review of DeBeers Snap Lake Mine 2018 Financial</td>
<td><strong>Comment</strong> Please find attached, the Brodie Consulting Memo - March 6, 2018 - Review of DeBeers Snap Lake Mine 2018 Financial Security Estimate <strong>Recommendation</strong> 1) It is recommended that De Beers and the Board refer to the attached memo that is</td>
</tr>
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<td></td>
<td><strong>Mar 13:</strong> Noted.</td>
</tr>
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<td></td>
<td></td>
<td>Noted.</td>
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</table>
Security Estimate submitted in support of ENRs comments and recommendations.

<table>
<thead>
<tr>
<th>ID</th>
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<th>Reviewer Comment/Recommendation</th>
<th>Proponent Response</th>
<th>Board Staff Analysis</th>
</tr>
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</table>

Comments from review of the Updated 2018 Financial Security Estimate Report, version 2

**Comment Summary**

<table>
<thead>
<tr>
<th>ID</th>
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<th>Reviewer Comment/Recommendation</th>
<th>Proponent Response</th>
<th>Board Staff Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General File</td>
<td><strong>Comment</strong> [doc] ENR Letter with Comments, Recommendations and Attachments <strong>Recommendation</strong></td>
<td></td>
<td>Noted.</td>
</tr>
<tr>
<td>4</td>
<td>Topic 2: Securities</td>
<td><strong>Comment</strong> Of note, the Department of Lands and the Department of ENR have reviewed the securities submission provided by De Beers and are in agreement with the comments below. Within the Land Use Permit amendment, De</td>
<td></td>
<td>On June 4, 2018 De Beers submitted version 3 of the 2018 Security Estimate</td>
</tr>
</tbody>
</table>
Beers has included an updated security estimate dated April 16, 2018. It is noted on the ORS review that: Condition 50: "Security Deposit - Commencement". On January 30, 2018 De Beers submitted a 2018 Financial Security Estimate Report. This was reviewed in February 2018 and reviewer comments were provided. De Beers has updated the 2018 Financial Security Estimate Report as per reviewer recommendations and has resubmitted it with this amendment application.

De Beers has requested that the security amount in Condition 50 of Permit MV2017D0032 be amended to the value suggested in the updated 2018 Financial Security Estimate Report (Version 2). In general De Beers responses to ENR comments, based on review of the January 30, 2018 Financial Security Estimate report, are reasonable in that most comments (e.g. water treatment types and duration and post-closure maintenance) are to be addressed or updated with submission of the Final Closure and Reclamation Plan. As per the assessment in the attached memo, the only difference between the January 2018 and April 2018 versions of the Financial Security Estimate is a reduction to Mob/Demob. This change stems from GNWT Comment ID 18 Topic 17: Mobilization on the previous Financial Security Estimate:

"Mobilization: It appears that there is an error in the calculation of equipment mobilization costs resulting in the estimate being too high. This may be a carryover from the Diavik estimate that was originally used for the Snap Lake mine. It appears that the loads per machine may be incorrect (column D) and as a result the calculation of mobilization costs. In any case, De Beers will have accurate costs for mobilization of equipment and supplies upon which the security estimate can be based. Recommendation: It is recommended that mobilization costs be based on the equipment list provided in Table A.6 of the Financial Security Estimate (Arktis, 2018) and known costs for mob/demob that De Beers will have available to them. This may result in a lower cost for mob/demob than what is in the 2018 estimate." De Beers' response was "Noted. The loads per machine will be updated accordingly". ENR's Report to address the recommendations from ENR.
The original comment was related to the table on the bottom of the Mob/Demob page in the Jan 30, 2018 estimate. This table presents the number of pieces of heavy equipment that will be required on-site, the number of loads that each machine will need to be broken into to meet ice road weight restrictions, and the round trip kilometres. The number of pieces of equipment is multiplied by the loads per machine which is multiplied by the round trip kilometres, which is multiplied by the per/km unit cost to provide an estimate of the mob/demob cost for heavy equipment. ENR noted that there appeared to be errors in this table, i.e. dump trucks are noted as requiring 10 loads per individual machine to move them to the site, service vehicles require 2 loads per individual machine, etc. It appears that De Beers' has addressed ENR's comment in the April 16, 2018 estimate by removing the "loads/machine" column from the calculation. This does not seem correct to ENR, since the heavier equipment may still require multiple loads to meet the ice road weight restrictions. ENR's intention was that De Beers should either re-visit the Mob/Demob table or else update the estimate with actual values based upon De Beers’ experience getting heavy equipment to and from Snap Lake. It appears that the resulting mob/demob costs are now too low.

Further, with attention focussed on this item, ENR has noted several other items that should be reviewed such as that the costs do not consider mob/demob from a regional center, which is typical practice for the other Diamond Mines.

**Recommendation**

1) To resolve errors and clarify the components of the mobilization costs, ENR recommends that De Beers include the following considerations for their mob and demob costs:
   - Mobilization to/from regional center (e.g. Edmonton) to Yellowknife;
   - Winter ice road tariff from Yellowknife to/from Snap Lake;
   - Number of machine loads where equipment must be delivered on more than one transport truck due to weight or size restrictions;
   - Use of appropriate unit costs or lump sums to account for other logistical considerations, such as mechanics required to assemble/disassemble equipment for transport.
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<td>4</td>
<td>Financial Security Estimate Report, V. 2. p.4. &quot;It is expected that expansion of the existing quarry by 7.5 ha can provide the necessary materials for final closure&quot;</td>
<td><strong>Comment</strong> Ensure that the expansion area is within established Leasehold boundaries. <strong>Recommendation</strong> Provide a copy of a map to the Inspector/GNWT Lands Administration showing the extent of the proposed quarry expansion vs. the existing Snap Lake Leasehold boundaries.</td>
<td>June 6: Should a quarry expansion be required, then De Beers would provide the requested map to GNWT lands administration.</td>
<td>Acceptable response.</td>
</tr>
<tr>
<td>5</td>
<td>Financial Security Estimate Report, V. 2. p.6 &quot;Contaminated soil from light hydrocarbon spills will be treated using an on-site landfarm&quot;</td>
<td><strong>Comment</strong> Is De Beers proposing a new landfarm location for this treatment, or is it planning to utilize the existing Landfarm? If the latter, when will treatment of the existing material currently staged in the Landfarm be treated, thereby creating space for this new landfarming? <strong>Recommendation</strong> 1. Is De Beers proposing a new landfarm location? If so, provide that information to the Bd. 2. Is De Beers proposing to utilize the existing landfarm location? If so, provide information on when/how De Beers will treat existing materials and thus make space for treatment of new contaminated soils.</td>
<td>June 6: De Beers proposes that the landfarm be relocated to an existing lined facility currently on site. Further detail will be proposed in future in the FCRP and Water License submission.</td>
<td>Acceptable response.</td>
</tr>
<tr>
<td>6</td>
<td>Financial Security Estimate Report, V. 2. p.6 2.2.5 Water Treatment</td>
<td><strong>Comment</strong> 1. Has the concept of treatment of seepage and processed water through a constructed wetland passive treatment system been conceptually approved by the EAR or MVLWB for Snap Lake? 2. What parameters of concern will require treatment (does modelling show what volumes and quality of water will need to be treated by the proposed wetland)? 3. Can wetlands fully treat all the parameters which are expected to need treatment during closure? 4. Will the water quality objectives for closure be achieved in the long term? Does water quality modelling predict that water quality</td>
<td>June 6: The concept of a wetland treatment process would be included in the final closure plan and water license renewal application should it be determined to be the best option to mitigate parameters of concern. De Beers is currently updating</td>
<td>Acceptable response.</td>
</tr>
<tr>
<td>Financial Security Estimate Report, V. 2. p.7 2.6.</td>
<td>Comment</td>
<td>The site and lake models which will inform the EQCs proposed as a component of the Licensing process. Currently wetland treatment is being evaluated to determine what could be required for post closure treatment. The modeling will inform whether this is in fact necessary.</td>
<td></td>
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<tr>
<td>Financial Security Estimate Report, V. 2. p.7 2.6.</td>
<td></td>
<td>June 6: For the purpose of a conservative financial security estimate, 2 caretakers are assumed to be at site during interim care and maintenance. The security estimate is based on the assumption that the government would execute the reclamation program. De Beers actual execution of care and maintenance and implementation of final closure differ in this regard. No personnel will be on site from approximately September to March aside from Monthly visits based from either</td>
<td></td>
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<tr>
<td>Financial Security Estimate Report, V. 2. p.7 2.6.</td>
<td>Comment</td>
<td>It appears that this 2 year interim care and maintenance period ends in Q2 2020, and thus is in place during the remaining 2018 period, 2019, and Q1 of 2020. (1). Does the caretaker presence thus mean that a minimum of 2 staff (caretakers) will be on site at all times during that time span? Recommendation Answer question (1).</td>
<td></td>
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</tbody>
</table>

will change over the long term, and will wetland treatment be sufficient to achieve treatment objectives in the long term as well as short term)?

**Recommendation** Answer 1-4.
|   | Yellowknife or Gahcho Kué. |   |
MEMORANDUM

DATE: May 23, 2018

TO: Paul Green; GNWT – ENR

FROM: Lara Fletcher, P. Eng. (BC, NT/NU)

SUBJECT: Review of DeBeers Snap Lake Mine 2018 Financial Security Estimate v.2

1 INTRODUCTION


According to the MVLWB Online Review System, De Beers is requesting to amend the following condition:

Condition 50: “Security Deposit – Commencement”. On January 30, 2018 De Beers submitted a 2018 Financial Security Estimate report. This was reviewed in February 2018 and reviewer comments were provided. De Beers has updated the 2018 Financial Security Estimate report as per reviewer recommendations and has resubmitted it with this amendment application. De Beers has requested that the Security amount in Condition 50 of Permit MV2017D0032 be amended to the value suggested in the updated 2018 Financial Security Estimate report (version 2).

As requested by GNWT-ENR, BCL has reviewed the updated 2018 Financial Security Estimate v2, as well as De Beers responses to ENR's comments regarding the January 30, 2018 version.

2 PREVIOUS COMMENTS

In general, De Beers responses to comments regarding the January 30, 2018 Financial Security Estimate were reasonable, with most recommendations to be addressed or updated with submission of the Final Closure and Reclamation Plan.

The only difference between the January 2018 and April 2018 versions of the Financial Security Estimate is a reduction to Mob/Demob of $1,240,988, which stems from Comment ID 18 Topic 17: Mobilization, which was:

Mobilization:
It appears that there is an error in the calculation of equipment mobilization costs resulting in the estimate being too high. This may be a carryover from the Diavik estimate that was originally used for the Snap Lake mine. It appears that the loads per machine may be incorrect (column D).
and as a result the calculation of mobilization costs. In any case, De Beers will have accurate costs for mobilization of equipment and supplies upon which the security estimate can be based.

**Recommendation:**

It is recommended that mobilization costs be based on the equipment list provided in Table A.6 of the Financial Security Estimate (Arktis, 2018) and known costs for mob/demob that De Beers will have available to them. This may result in a lower cost for mob/demob than what is in the 2018 estimate.

De Beers response was "Noted. The loads per machine will be updated accordingly".

3 FOLLOW UP COMMENT

The difference between the January 30, 2018 and the April 16, 2018 version is that De Beers has deleted a column intended to capture the number of loads per piece of equipment. The result is a decrease of $1,240,988. In an email to GNWT-ENR (May 18), De Beers added "The adjustment is in response to GWNT’s (Brodie) review which noted that ARKTIS overestimated the number of pieces of equipment that can fit onto one transport truck to/from site. As a result, the number of trucks used to haul reclamation equipment has reduced a marginal amount in the April 2018 report compared to the January 2018 version."

It appears that the resulting mob/demob costs are now too low. Further, with attention focussed on this item, it is noted that the costs do not consider mob/demob from a regional center.

**Recommendation:**

To resolve errors and clarify the components of the mobilization costs, ENR recommends that De Beers present mob and demob costs as:

- Mobilization to/from regional center (e.g. Edmonton) to Yellowknife;
- Winter ice road tariff from Yellowknife to/from Snap Lake;
- Where equipment must be delivered on more than one transport truck due to weight or size restrictions, this should also be reflected in the costs;
- Though there are other logistical considerations, such as mechanics to assemble/dissassemble equipment for transport, rather than attempt too detailed an estimate it can more simply be reflected in the selection of appropriate unit costs or lump sums.

As noted above, many of the other potential adjustments to security that have been recommended for review have been deferred to submission of the final CRP. Focusing on this item of the financial security estimate is not suggesting it is of any more or less significance. Rather, it is a follow up to De Beers’ request for a reduction to the security of $1.2M resulting in what was initially identified as a mistake in a calculation without fully considering the intent of the comment.

References:

May 31, 2018

Dear Ms. Leach,

Re: DeBeers - Snap Lake
Land Use Permit Amendment Application – MV2017D0032
Amendment of Permit Conditions
Request for Comment

The Department of Environment and Natural Resources (ENR), Government of the Northwest Territories has reviewed the amendment at reference based on its mandated responsibilities under the Environmental Protection Act, the Forest Management Act, the Forest Protection Act, the Species at Risk (NWT) Act, the Waters Act and the Wildlife Act and provides the following comments and recommendations for the consideration of the Board.

**Topic 1: Interim Closure and Reclamation Plan**

**Comment(s):**

De Beers notes that the Land Use Permit requires that an updated Interim Closure and Reclamation Plan (ICRP) be submitted by January 30, 2018. Under the Water Licence, De Beers had requested that an updated ICRP not be required, given the Extended Care and Maintenance Phase, and that a Final Closure and Reclamation Plan be submitted with a Water Licence renewal application in 2019 (the current Water Licence expires in June 2020).

In a letter from ENR to the Board dated January 15, 2018, in response to De Beers’ request, ENR noted that:
“ENR supports the position of De Beers to delay submission of a Closure Plan until 2019 when a FCRP will be submitted. ENR will continue to work with the Board and De Beers through the development of this plan as required.”

**Recommendation(s):**

1) ENR continues to support De Beers’ plan to submit a Final Closure and Reclamation Plan in 2019.

**Topic 2: Securities**

**Comment(s):**

Of note, the Department of Lands and the Department of ENR have reviewed the securities submission provided by De Beers and are in agreement with the comments below.

Within the Land Use Permit amendment, De Beers has included an **updated security estimate dated April 16, 2018**. It is noted on the ORS review that:

**Condition 50**: “Security Deposit – Commencement”. On January 30, 2018 De Beers submitted a 2018 Financial Security Estimate Report. This was reviewed in February 2018 and reviewer comments were provided. De Beers has updated the 2018 Financial Security Estimate Report as per reviewer recommendations and has resubmitted it with this amendment application. De Beers has requested that the security amount in Condition 50 of Permit MV2017D0032 be amended to the value suggested in the updated 2018 Financial Security Estimate Report (Version 2).”

In general De Beers responses to ENR comments, based on review of the January 30, 2018 Financial Security Estimate report, are reasonable in that most comments (e.g. water treatment types and duration and post-closure maintenance) are to be addressed or updated with submission of the Final Closure and Reclamation Plan. As per the assessment in the attached memo, the only difference between the January 2018 and April 2018 versions of the Financial Security Estimate is a reduction to Mob/Demob. This change stems from GNWT Comment ID 18 Topic 17: Mobilization on the previous Financial Security Estimate:

**Mobilization:**

*It appears that there is an error in the calculation of equipment mobilization costs resulting in the estimate being too high. This may be a carryover from the Diavik estimate that was originally used for the Snap Lake mine. It appears that the loads per machine may be incorrect (column D) and as a result the calculation of mobilization costs. In any case, De Beers will have accurate costs*
for mobilization of equipment and supplies upon which the security estimate can be based.

Recommendation:

It is recommended that mobilization costs be based on the equipment list provided in Table A.6 of the Financial Security Estimate (Arktis, 2018) and known costs for mob/demob that De Beers will have available to them. This may result in a lower cost for mob/demob than what is in the 2018 estimate.”

De Beers’ response was “Noted. The loads per machine will be updated accordingly”.

ENR’s original comment was related to the table on the bottom of the Mob/Demob page in the Jan 30, 2018 estimate. This table presents the number of pieces of heavy equipment that will be required on-site, the number of loads that each machine will need to be broken into to meet ice road weight restrictions, and the round trip kilometres. The number of pieces of equipment is multiplied by the loads per machine which is multiplied by the round trip kilometres, which is multiplied by the per/km unit cost to provide an estimate of the mob/demob cost for heavy equipment. ENR noted that there appeared to be errors in this table, i.e. dump trucks are noted as requiring 10 loads per individual machine to move them to the site, service vehicles require 2 loads per individual machine, etc.

It appears that De Beers’ has addressed ENR’s comment in the April 16, 2018 estimate by removing the “loads/machine” column from the calculation. This does not seem correct to ENR, since the heavier equipment may still require multiple loads to meet the ice road weight restrictions. ENR’s intention was that De Beers should either re-visit the Mob/Demob table or else update the estimate with actual values based upon De Beers’ experience getting heavy equipment to and from Snap Lake.

It appears that the resulting mob/demob costs are now too low. Further, with attention focussed on this item, ENR has noted several other items that should be reviewed such as that the costs do not consider mob/demob from a regional center, which is typical practice for the other Diamond Mines.

Recommendation(s):

1) To resolve errors and clarify the components of the mobilization costs, ENR recommends that De Beers include the following considerations for their mob and demob costs:

- Mobilization to/from regional center (e.g. Edmonton) to Yellowknife;
- Winter ice road tariff from Yellowknife to/from Snap Lake;
• Number of machine loads where equipment must be delivered on more than one transport truck due to weight or size restrictions;
• Use of appropriate unit costs or lump sums to account for other logistical considerations, such as mechanics required to assemble/disassemble equipment for transport.

Comments and recommendations were provided by ENR technical experts in the Water Resources Division and the North Slave Region and were coordinated and collated by the Environmental Assessment and Monitoring Section (EAM), Conservation, Assessment and Monitoring Division (CAM).

Should you have any questions or concerns, please do not hesitate to contact Patrick Clancy, Environmental Regulatory Analyst at (867) 767-9233 Ext: 53096 or email patrick_clancy@gov.nt.ca.

Sincerely,

[Signature]

Patrick Clancy
Environmental Regulatory Analyst
Environmental Assessment and Monitoring Section
Conservation, Assessment and Monitoring Division
Department of Environment and Natural Resources
Government of the Northwest Territories

DATE: March 6, 2018

TO: Paul Green; GNWT – ENR

FROM: Lara Fletcher, P. Eng. (BC, NT/NU), John Brodie, P.Eng. (BC, NT/NU)


1 INTRODUCTION

De Beers Canada Inc. submitted an updated security estimate for the Snap Lake Mine to the Mackenzie Valley Land and Water Board (MVLWB) on January 30, 2018. This submission is required by Part C, item 3 of Licence MV2011L2-0004.

An Interim Closure and Reclamation Plan (ICRP) was also due for submission on January 30, 2018. However, with the decision to proceed with the closure of the mine, De Beers has requested to not submit an ICRP but to submit a Final Closure and Reclamation Plan in 2019 (De Beers, 2017a).

De Beers' updated security estimate cover letter states that "This estimate update was prepared based on the assumptions made prior to the decision to proceed with the closure of the Snap Lake Mine. De Beers will update this financial security estimate based on the details that will be provided in the Final Closure and Reclamation Plan when this plan is submitted in 2019."

Review of the January 30, 2018 security estimate was limited for the following reasons:

- Much of the information required to answer the substantive questions regarding closure, reclamation and post-closure management of the site has yet to be submitted. This includes:
  - Updated water quality models that consider the North Pile thermal predictions, geochemistry and weathering of processed kimberlite.
  - Updated thermal monitoring and predicted time for the North Pile to freeze.
  - Final Closure Plan for the North Pile.
  - Approved closure criteria for seepage and runoff.
  - Reclamation research, which includes vegetation trials that have only just gotten underway (De Beers, 2017e) as well as approval for what is being proposed.
  - Assessments to support pumping of surface water and or water treatment residuals underground and for how long this may be required and/or viable.
Monitoring and maintenance requirements following active closure, for a transition period, and long term post-closure.

- It is assumed that most of De Beers responses to comments will be deferred to submission of the Final CRP, as was demonstrated in responses to the comments regarding the 2016 Annual Closure and Reclamation Plan Progress Report.

- It is assumed that a more thorough review will be undertaken with De Beers' submission of the Final Closure and Reclamation Plan (CRP) in 2019.

Comments are based primarily on the following documents that were reviewed:

- Extended Care and Maintenance Plan V2.2 (De Beers, 2017b)
- Water Management Plan for Extended Care and Maintenance (De Beers, 2017c)
- 2016 Annual Water Licence Report (De Beers, 2017d) [SNP02-02 North Pile Runoff Water Quality and SNP02-14 Water Management Pond summary monitoring data only]
- Annual Closure and Reclamation Plan Progress Report Snap Lake Mine 2016 (De Beers, 2017e)
- Mackenzie Valley Land and Water Board Snap Lake 2016 Annual Closure and Reclamation Plan Progress Report Staff Report and Comment Table

2 COMMENTS

The 2018 Financial Security Estimate (Arktis, 2018) is well prepared and thorough. Assumptions upon which the security estimate was based are made explicit. Quantities are detailed and for many of the activities high unit costs were selected from the RECLAIM unit cost table.

As such, the security estimate is considered acceptable for the activities described. However, as stated previously, much of the information required to answer the substantive questions regarding closure, reclamation, and post-closure management of the site has yet to be submitted. Each of which have the potential to impact the financial liability of the site.

2.1 Water Management Plan

2.1.1 Pumping Surface Water and Water Treatment Residuals Underground

Within the Mine Water Management Plan De Beers describes the option to pump poor quality water from the surface that has interacted with mine surface infrastructure either directly underground, or through the water treatment system with process residuals pumped underground. In De Beers' response to comment GNWT ENR - 2 review of the Extended Care and Maintenance Plan (MVWLB 2018), De Beers indicates that:

The estimated volume of surface waters to manage each year is 400,000 m³. This water is expected to have high TDS levels and to have a similar chemical signature as the underground mine water encountered during mining operations...De Beers notes that the surface water can be dealt with in one of three ways: 1. Discharged to Snap Lake if it meets the EQC's 2. Discharged underground if it does not meet the EQC's 3. Treated and discharged to Snap Lake and with process residuals being discharged underground. De Beers expects approximately 30-50% of the surface waters will be discharged...
underground.... De Beers will continue to discharge TDS water underground to the 5180 level (consistent with the MVLWB approved Water Management Plan) approximately 260m below the mine entrance. This discharge is into the deeper connate (saline) waters already present at those depths in the mine workings. This deep saline water forms a chemocline within the underground mine water column, which restricts this water from rising due to its density.

Section 2.4.3 of the Water Management Plan for Extended Care and Maintenance (De Beers 2017) states:

Due to the nature of the Snap Lake Mine Underground, the upper levels of the mine will be buffered from turbulent flow (limited to seasonal discharge) associated with the pumping of surface water underground allowing for the stabilization of the chemocline.

Conceptually, De Beers plan to pump surface water and or process residuals underground seems to be a good and relatively inexpensive plan. The risks are that discharging poor quality water into the mine could eventually surface, either subsurface into Snap Lake, or at surface from the mine openings. It is not known whether any hydrogeological assessments and stratification modelling have been completed to support the plan.

**Recommendation:**
It is recommended that De Beers provide any reports available of hydrogeological assessments and stratification modelling to support the plan to pump surface water and or process residuals underground. Any restrictions should be described, such as pumping rates, the volume that can be disposed of annually, as well as how many years this could be relied upon if required.

### 2.1.2 Duration of Water Treatment

The North Pile collection system will continue to function for some period of time until the surface runoff and any seepage waters are of acceptable quality for direct discharge. The security estimate currently includes three years of water treatment. Two during Interim Care and Maintenance, and one during Closure.

Deposition into the North Pile ceased in December, 2015. Drainage, consolidation and freezing of the pile will have been occurring for three years now, which will reduce the number of years seepage and runoff will continue to require treatment. However, the following factors give rise to uncertainty in the number of years remaining:

- Updated thermal monitoring and water quality modelling has not been submitted;
- It is not clear what passive treatment is being proposed and how effective it will be (see comment regarding passive treatment);
- Importantly, criteria for surface water quality have yet to be approved.

Given the high concentrations of contaminants in the North Pile (De Beers 2017d), and that active closure will result in increased disturbance of the site, it seems optimistic that only three years of water treatment will be required.
**Recommendation:**
It is recommended that the interim security estimate be adjusted to assume a minimum of five years of water treatment will be required. Two years during ICM, two years during active closure, and one year following active closure. Based on the annual cost presented in the security estimate, this would result in an increase in direct costs of $1,283,858.

Updates to the security estimate should link the duration of water treatment to the predictions based on updated water quality models.

### 2.1.3 Costs for Water Treatment
As part of the Post- EA Information Package, DeBeers provided the report "Preliminary Evaluation of Best Available Technologies Economically Achievable (BATEA) for Reduction of Total Dissolved Solids (TDS) in Effluent at Snap Lake Mine " (DeBeers, 2014). At that time, DeBeers reported that a mini-modular reverse osmosis test unit was to be commissioned in 2015 having a capacity of 3,000m$^3$/day with a cost of $0.5M/yr operating expenditure,$1.4M/yr for power, and $1M/year labour for a total of $2.9M/year. ($2.65/m$^3$ if assumed this was based on year round operation).

The 2018 security estimate includes a provision for water treatment of 235,754m$^3$ at a RECLAIM default unit cost of $2.00/m$^3$ for a subtotal of $471,508. Based on earlier estimates of running the RO plant, combined with the existing water treatment system, this seems optimistically low.

It is understood that a microfiltration and reverse osmosis unit will be commissioned for treatment in the coming months and refined information regarding efficiency and costs will become available.

**Recommendation:**
Consistent with information that has been requested for most mines within the GNWT, it is recommended De Beers provide a detailed breakdown of costs for water treatment. Costs should be based on known costs of operating the existing water treatment system, and estimates of the microfiltration and RO units. Costs should include: labour, power, reagents, supplies, analytical testing, maintenance, and annual commissioning and decommissioning. The security estimate should be revised accordingly.

### 2.1.1 Passive Water Treatment
Section 2.2.5 of the Financial Security Estimate (Arktis, 2018) indicates that:

> After three years of active treatment, seepage and contact water will be allowed to flow naturally through a constructed wetland passive treatment system in the area of PS5/IL6 and the WMP before entering into the aquatic environment. Primary costs for water management via constructed wetlands include those related to construction and revegetation.

Provisions in the security estimate for a wetland treatment system make reference to the proposed Fortune Minerals Nico Project (Golder, 2014). It is not known what parameters De Beers intends to target with passive treatment, or whether a similar system to Nico is what is being proposed. It should be noted that AANDC's intervention for the Nico Project (AANDC, 2014) can be summarized as having stated support for passive water treatment, but that considerable more work was required to demonstrate reliable performance. This was in addition to the work that had already completed.
It is not known what parameters a constructed wetland semi-passive water treatment system is required for, how effective it will be, and for how many years it will be required (security estimate states "assume 3 years"). BCL is of the opinion that passive treatment of saline contaminated water is not viable, especially in a northern setting. Typically, additional active water treatment would be recommended for the security estimate until a semi-passive system can be demonstrated to be effective. However, the 2018 security estimate includes a provision of nearly $2.5M for a passive system. If a passive system is not approved, the $2.5M could be allocated to longer active water treatment. This will have to be reviewed further with submission of a Final Closure and Reclamation Plan that details the proposed semi-passive system.

**Recommendation:**
It is recommended that further evaluation of the proposed semi-passive water treatment system be carried out with submission of a Final Closure and Reclamation Plan. If not approved, the security estimate should be updated to reflect longer term active water treatment.

### 2.2 Tailings Management Facility (North Pile)

Section 2.2.2 of the Financial Security Estimate (Arktis, 2018) states that "The final condition of the North Pile involves covering the surface with an approximate 0.5 m thick rock cover that will be re-evaluated during the final closure design." Quantities provided in the security estimate are based on the currently approved closure plan and changes to the North Pile due to premature closure. Detailed calculations are provided, and a high unit cost adopted from RECLAIM that includes quarrying materials. Section A.1.2 states "High cost code applied to address potential construction conditions regarding trafficability on the processed kimberlite."

Appropriate unit costs for capping of waste rock and tailings storage areas has been a topic of discussion for reviews of the Diavik and Ekati mines security estimate. Therefore, it is noted that the unit costs in De Beers Snap Lake 2018 estimate ($18.04/m$^3$) is lower than the previous security estimate of $35.23/m^3$ (Arktis, 2011) but higher than those in the Diavik and Ekati estimates. Therefore, the costs for closure of North Pile are considered appropriate at this time and should be reviewed with submission of the final design for closure of the North Pile.

**Recommendation:**
The provisions for closure of the tailings management facility (North Pile) are considered appropriate at this time. The closure plan may be revised in the Final CRP. Quantities, costs, and maintenance requirements should be further evaluated.

### 2.3 Post-Closure Management

De Beers have included provisional costs for 25 years of monitoring and maintenance in the security estimate. Section 2.3.2 of the Financial Security Estimate (Arktis, 2018) states:

> At present, the monitoring cost estimate includes all monitoring activities including approximately two years of care and maintenance (ending in Q2 2020), two years of final reclamation and demobilization (ending in Q2 2022), and the twenty years which is considered to be the post reclamation monitoring phase.

Provisions for 20 years of post reclamation maintenance include $25,000 per year for Years 1-3; $10,000 per year for Years 4 - 10, then $5,000 in Years 15 and 20. Maintenance requirements following final closure are difficult to predict. However, any amount of maintenance will require mobilization of equipment. Options are: purchase equipment and leave on site, rebuild the ice
road, or fly in equipment. All of which are very expensive. As such, the provisions in the 2018 security estimate are considered inadequate.

GNWT are more fully evaluating an approach and policy for the long term management of all mines within the Northwest Territories. Costs for monitoring and maintenance will require a more thorough review with submission of the Final Closure Plan, which is acknowledged in the Financial Security Estimate (Arktis, 2018).

**Recommendation:**
It is recommended that the costs for monitoring and maintenance undergo a more thorough review with submission of the Final Closure and Reclamation Plan.

### 2.4 Mobilization
It appears that there is an error in the calculation of equipment mobilization costs resulting in the estimate being too high. This may be a carryover from the Diavik estimate that was originally used for the Snap Lake mine. It appears that the loads per machine may be incorrect (column D) and as a result the calculation of mobilization costs. In any case, De Beers will have accurate costs for mobilization of equipment and supplies upon which the security estimate can be based.

**Recommendation:**
It is recommended that mobilization costs be based on the equipment list provided in Table A.6 of the Financial Security Estimate (Arktis, 2018) and known costs for mob/demob that De Beers will have available to them. This may result in a lower cost for mob/demob than what is in the 2018 estimate.

**References**


Mackenzie Valley Land and Water Board, 2018. De Beers Canada Inc., - Snap Lake - Notification of Final Closure and Request to not file and ICRP; and Extended Care and Maintenance Plan v.2 (MV2011L2-0004 & MV2017D0032) Review Comment Table
March 6, 2018

Jen Potten
Regulatory Officer
Mackenzie Valley Land and Water Board
7th Floor – 4910 50th Avenue
P.O. Box 2130
Yellowknife, NT
X1A 2P6

Dear Ms. Potten,

Re: DeBeers – Snap Lake
Water Licence – MV2011L2-0004
Snap Lake - Financial Security Estimate - RECLAIM Update
Request for Comment

The Department of Environment and Natural Resources (ENR), Government of the Northwest Territories (GNWT) has reviewed the documents at reference based on its mandated responsibilities under the Environmental Protection Act, the Forest Management Act, the Forest Protection Act, the Species at Risk (NWT) Act, the Waters Act and the Wildlife Act and provides the following comments and recommendations for the consideration of the Board.

**Topic 1: General - Cover letter & Crediting System**

Comment(s):

In reference to Environmental Agreement (the Agreement) security held with the GNWT-ENR, De Beers states in the cover letter expectations for a consistent process approach when allocating the entire security for the Mine, as with the last RECLAIM revision.

Two types of security are provided for under the Agreement. As outlined in Clause 12.1(a) of the Agreement, the Security Deposit and the Additional Security Deposit are to be held by the Minister of Environment and Natural Resources “...as security for the performance by DBCMI of its closure and reclamation obligations under the Water Licence and Land Leases, any other indebtedness or obligations of DBCMI
under environmental laws, regulations or other Regulatory Instruments for which the Minister is responsible and any other obligations of DBCMI under this Agreement...

The Security Deposit is currently set at $47,000,000. The GNWT does not hold any security under the Security Deposit (for Environmental Agreement) due to the crediting schedule outlined in Clause 12.1(e) and 12.1(f), which requires the amount of security posted under Land Leases, the Water Licence and Land Use Permits (LUPs) (provided the LUP security is for the purpose of final closure and reclamation) to be credited against the Security Deposit.

Recommendation(s):

1) GNWT-ENR will continue to credit the Security Deposit up to $47,000,000.

**Topic 2: General – Cover Letter & Additional Security (ADS)**

Comment(s):

De Beers acknowledges that a portion of the total security under the Agreement is held with the GNWT-ENR. The amount held by the Minister is $20,000,000 for performance obligations that are not covered by the security deposit, which as stated, is credited against the relevant licenses, permits or leases.

Recommendation(s):

1) ENR holds security for obligations under the Agreement, such as wildlife and air quality monitoring, and that we believe that those items should be removed from RECLAIM to avoid double bonding. While it is the GNWT’s position that security for air and wildlife should be held under the Agreement, the GNWT is providing comments on those topics for the Board’s consideration.

**Topic 3: Wildlife and Wildlife Habitat Protection Plans (WWHPPs)**

Comment(s):

The Updated Financial Security Estimate notes on page A-19, that the Wildlife Effects Monitoring Program (WEMP) will be reduced to monitoring on a five year cycle following the end of mining. There is no mention of the Wildlife and Wildlife Habitat Protection Monitoring Program (WWHPP) that is currently undertaken by De Beers.
Recommendation(s):

1) Please clarify De Beers’ proposed monitoring schedule for the WWHPP.

**Topic 4: Cost Estimates for Combined Aquatic and Wildlife Effects**

**Comment(s):**

Table A.9 page A-21 and 22 displays aquatic and wildlife effects monitoring programs as a combined cost item.

**Recommendation(s):**

1) Wildlife effects monitoring would be better reflected as a single line item separated from that of aquatics in order to assess what costs are being assigned to wildlife effects monitoring. More information, such as which valued components are being monitored and the frequency and method of monitoring, are required in order to assess whether De Beers’ cost estimate for wildlife effects monitoring is accurate.

**Topic 5: Environmental Agreement Monitoring & RECLAIM Security Alignment**

**Comment(s):**

While the Interim Closure and Reclamation Plan outlines some monitoring schedules it is important for De Beers to also consider requirements under the Agreement when proposing new monitoring schedules. Clause 6.3(d) requires De Beers to design an Air Quality and Emissions Management Plan in consultation with Environment Canada, and the GNWT, and for the plan to be reviewed with Environment Canada, the GNWT and SLEMA if there is a major change in infrastructure or emission quantity/quality. Likewise, Clause 6.3(g) requires consultation with the GNWT and SLEMA when developing a Wildlife Monitoring Plan. The GNWT takes this to mean that consultation is required when deviating from the current Air Quality and Emissions Monitoring and Management Plan, WEMP and WWHPP monitoring programs. In addition, the Agreement also identifies what components need to be monitored for air and wildlife.

**Recommendation(s):**

1) The GNWT would welcome a meeting between De Beers and SLEMA to discuss the closure and post-closure air and wildlife monitoring requirements under the Agreement. Until an agreement between De Beers, GNWT and SLEMA is reached on the closure and post-closure air and wildlife monitoring frequency it is
difficult to assess whether the cost estimates put forward by De Beers in the
RECLAIM estimate are accurate.

**Topic 6: Cohesion of Table A.9 page A-21**

**Comment(s):**

The monitoring phases are projected by year. The dates do not appear to be correct.
In addition, the phases in this table do not match the phases that are described in
Table A.7. For example, Interim Care and Maintenance (ICM) on Table A.9 is a phase
that is not described in table A.7 and the ICM phase is described to start in 2029.

**Recommendation(s):**

1) Please review and revise the discussed table(s) accordingly for better cohesion
   of the document.

**Topic 7: Table A.8 Timelines**

**Comment(s):**

This table includes a progression of timelines, but it would be more effective if the
years were recorded.

**Recommendation(s):**

1) It is recommended to include the year in which costs are being attributed.

**Topic 8: Air Quality Monitoring**

**Comment(s):**

Page A-19 indicates that “Air quality monitoring will continue at a similar scope to
operations during the final reclamation phase, following which it will be reduced to
activities completed once each summer, then terminated following Year 3 post
closure”. Was this statement made in consideration of the Agreement, which
requires air quality monitoring (Clause 6.3(d) and 7.2(a))? Will this include TSP
monitoring, as was done during operations and required under the Agreement?

**Recommendation(s):**

1) It is recommended that changes to air quality monitoring, that would be
   considered a departure from the Agreement, have evidence of support and sign-
   off by all parties. Can greater clarity on the monitoring (eg. TSP) be provided at
this time? Until the parameters and frequency of the closure and post-closure air monitoring is agreed to by the GNWT and SLEMA, as required by the Agreement, it is difficult to assess whether the cost estimates put forward by De Beers in the RECLAIM estimate are accurate.

**Topic 9: Scaling Approach for Cost Estimates**

**Comment(s):**

The scaling factor takes into account several things, including reductions in monitoring requirements that were strictly related to operations. Without updates to monitoring plans, it is very difficult to determine if these estimates (which give an indication on the approach to monitoring) are sufficient.

**Recommendation(s):**

1) It is recommended that approval of the security update is re-evaluated as additional information is available through the Final Closure and Reclamation Plan.

**Topic 10: Final Closure Information**

**Comment(s):**

ENR notes that the current estimate is based upon assumptions made prior to the decision to proceed with the closure of the Snap Lake Mine. As such, information remains outstanding regarding several important closure components such as:

- Updated water quality models that consider the North Pile thermal predictions, geochemistry and weathering of processed Kimberlite;
- Updated thermal monitoring and predicted time for the North Pile to freeze;
- Final Closure Plan for the North Pile;
- Approved closure criteria for seepage and runoff;
- Reclamation research, which includes vegetation trials that have only just gotten underway (De Beers, 2017b) as well as approval for what is being proposed;
- Assessments to support pumping of surface water and or water treatment residuals underground and for how long; and
- Monitoring and maintenance requirements following active closure, for a transition period, and post-closure.
ENR expects that these topics will become better understood as the Final Closure and Reclamation Plan is developed for the site.

**Recommendation(s):**

1) ENR recommends that a thorough review of the security be undertaken with submission of the Final Closure Plan.

**Topic 11: Water Management – Pumping to Underground**

**Comment(s):**

Within the Mine Water Management Plan De Beers describes the option to pump poor quality water from the surface that has interacted with mine surface infrastructure either directly underground, or through the water treatment system with process residuals pumped underground. De Beers has indicated that: “Due to the nature of the Snap Lake Mine Underground, the upper levels of the mine will be buffered from turbulent flow (limited to seasonal discharge) associated with the pumping of surface water underground allowing for the stabilization of the chemocline.”

ENR is not aware whether De Beers has conducted any studies such as hydrogeological assessments or stratification modelling to support the plan.

**Recommendation(s):**

1) ENR recommends that De Beers provide any reports available of hydrogeological assessments and stratification modelling to support the plan to pump surface water and/or process residuals underground. Any restrictions should be described, such as pumping rates, the volume that can be disposed of annually, as well as how many years this could be relied upon if required.

**Topic 12: Water Treatment Duration**

**Comment(s):**

The North Pile collection system will continue to function for some period of time until the surface runoff and any seepage waters are of acceptable quality for direct discharge. The security estimate currently includes three years of water treatment: two during Interim Care and Maintenance, and one during Closure.
ENR acknowledges that deposition into the North Pile ceased when Snap Lake operations finished and therefore drainage, consolidation and freezing of the pile have been occurring for approximately three years.

However, the following factors give rise to uncertainty in the number of years remaining:

- Updated thermal monitoring and water quality modelling has not been submitted;
- It is not clear what passive treatment is being proposed and how effective it will be (see comment regarding passive treatment);
- Criteria for surface water quality have not been finalized.

Given the high concentrations of contaminants in the North Pile (De Beers 2017a), and that active closure will result in increased disturbance of the site, it seems optimistic that only three years of water treatment will be required.

**Recommendation(s):**

1) ENR recommends that the security estimate be adjusted to assume a minimum of five years of water treatment will be required: two years during ICM, two years during active closure, and one year following active closure. Based on the annual cost presented in the security estimate, this would result in an increase in direct costs of **$1,283,858**.

2) ENR recommends that future updates to the security estimate should link the duration of water treatment to water quality predictions based on updated water quality models.

**Topic 13: Water Treatment Costs**

**Comment(s):**

As part of the Post-EA Information Package, DeBeers provided the report "Preliminary Evaluation of Best Available Technologies Economically Achievable (BATEA) for Reduction of Total Dissolved Solids (TDS) in Effluent at Snap Lake Mine" (DeBeers, 2014). At that time, DeBeers reported that a mini-modular test unit was to be commissioned in 2015 having a capacity of 3,000m³/day with a cost of $0.5M/yr operating expenditure, $1.4M/yr for power, and $1M/year labour for a total of $2.9M/year ($2.65/m³ if assumed this was based on year round operation).

The 2018 security estimate includes a provision for water treatment of 235,754m³ at a RECLAIM default unit cost of $2.00/m³ for a subtotal of $471,508. Based on
earlier estimates of running the RO plant, combined with the existing water treatment system, this seems low.

ENR understands that a microfiltration and reverse osmosis unit will be commissioned for treatment in the coming months and refined information regarding efficiency and costs will become available.

**Recommendation(s):**

1) ENR recommends that a detailed breakdown of costs for water treatment be provided. Costs should be based on known costs of operating the existing water treatment system, and estimates of the microfiltration and RO units. Costs should include: labour, power, all chemicals, supplies, analytical testing, and maintenance costs. The security estimate should be revised accordingly. ENR notes that this information is requested for most mines operating in the NWT.

**Topic 14: Passive Wetland Treatment**

**Comment(s):**

Section 2.2.5 of the Financial Security Report (Arktis, 2018) indicates that:

*After three years of active treatment, seepage and contact water will be allowed to flow naturally through a constructed wetland passive treatment system in the area of PS5/IL6 and the WMP before entering into the aquatic environment. Primary costs for water management via constructed wetlands include those related to construction and revegetation.*

Provisions in the security estimate for a wetland treatment system make reference to the proposed Fortune Minerals Nico Project (Golder, 2014). It is not known what parameters De Beers intends to target with passive treatment, or whether a similar system to Nico is what is being proposed. It should be noted that AANDC’s intervention for the Nico Project (AANDC, 2014) can be summarized as having stated support for passive water treatment, but that considerable more work was required to demonstrate reliable performance. This was in addition to the work that had already completed.

It is not known what parameters a constructed wetland semi-passive water treatment system is required for, how effective it will be, and for how many years it will be required (security estimate states "assume 3 years"). Typically, additional active water treatment would be recommended for the security estimate until a semi-passive system can be demonstrated to be effective. However, as the 2018 security estimate includes a provision of nearly $2.5M for a passive system the $2.5M could be allocated to longer term active water treatment if a passive system is
not approved. This will have to be reviewed further with submission of a Final Closure and Reclamation Plan that details the proposed semi-passive system.

**Recommendation(s):**

1) ENR recommends that further evaluation of the proposed semi-passive water treatment system and associated costs be carried out with submission of a Final Closure and Reclamation Plan. If not approved, the security estimate should be updated to reflect longer term active water treatment.

**Topic 15: North Pile – Unit Rate**

**Comment(s):**

De Beers is proposing to use the “high” unit cost from RECLAIM Ver. 7 for estimating the cost to close the North Pile. ENR notes that this unit cost is lower than in previous estimates for Snap Lake, but that the selected rate is from the RECLAIM model, and is higher than the unit cost used at the Diavik and Ekati sites.

ENR does not have specific recommendation regarding the selected unit rate at this time, but notes that closure costs for the North Pile should be further evaluated as additional information becomes available through completion of the Final CRP.

**Recommendation(s):**

1) ENR recommends that the closure costs for the North Pile be further evaluated upon submission of the Final CRP.

**Topic 16: Post-Closure Management**

**Comment(s):**

De Beers has included an allowance for 25 years of post-closure monitoring and 15 years of post-closure maintenance. ENR is concerned that the maintenance provisions in the security estimate are insufficient. As noted previously, information on a number of items (such as thermal modelling and time to freezing predictions, seepage quality criteria, vegetation trials, etc.) will become available as the Final CRP is developed and reclamation research is completed. The post-closure monitoring allowance should be further evaluated as this information becomes available in the Final CRP. This need for further evaluation is acknowledged in the Arktis estimate.
Recommendation(s):

1) ENR recommends that the Post-Closure Monitoring and Maintenance costs be further evaluated upon submission of the Final CRP.

**Topic 17: Mobilization**

Comment(s):

It appears that there is an error in the calculation of heavy equipment mobilization costs, which may be a carryover from the previous estimate. It appears that the loads per machine may be incorrect (column D) and as a result the calculation of mobilization costs.

Recommendation(s):

1) ENR recommends that mobilization costs be based on the equipment list provided in the Financial Security Report (Arktis, 2018) as well as known costs for mob/demob that De Beers may have available.


Comment(s):


Recommendation(s):

1) It is recommended that De Beers and the Board refer to the attached memo that is submitted in support of ENR’s comments and recommendations.

**Topic 19: References**

Comment(s):


De Beers, 2017a. 2016 Annual Water Licence Report [SNP02-02 North Pile Runoff Water Quality and SNP02-14 Water Management Pond summary monitoring data only]


**Recommendation(s):**

None.

Comments and recommendations were provided by ENR technical experts in the Water Resources Division, Conservation, Assessment and Monitoring Division and the North Slave Region and were coordinated and collated by the Environmental Assessment and Monitoring Section (EAM), Conservation, Assessment and Monitoring Division (CAM).

Should you have any questions or concerns, please do not hesitate to contact Patrick Clancy, Environmental Regulatory Analyst at (867) 767-9233 Ext: 53096 or email patrick_clancy@gov.nt.ca.

Sincerely,

Patrick Clancy
Environmental Regulatory Analyst
Environmental Assessment and Monitoring Section
Conservation, Assessment and Monitoring Division
Department of Environment and Natural Resources
Government of the Northwest Territories

May 31, 2018

Re: Request to Revise Condition Items of Land Use Permit

Dear Ms. Leach,

Snap Lake Environmental Monitoring Agency (SLEMA) has reviewed the above request, and would like to provide the following comments.

- Monthly inspections of fuel storage containers and tanks are acceptable for Snap Lake Mine only if reasonable measures are taken during the periods of zero occupancy at the mine site. It is recommended that the MVLWB provide clear directions in the amended Land Use Permit on remote monitoring.
- De Beers’ request on deferral of the submission of the Interim Closure and Reclamation Plan is acceptable, i.e. the submission of an interim closure and reclamation plan is not required and will be replaced by a Final Closure Plan, which will be submitted the same date as the submission for renewal of its water license.

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

Sincerely,

Original signed by

Philippe di Pizzo
Executive Director