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Staff Report

Applicant: De Beers Canada Inc. – Gahcho Kué Project	
Location: Kennady Lake, NT	**File Number(s):** MV2005L2-0015
Date Prepared: October 22, 2021	**Date of Board Meeting:** October 28, 2021
Subject: 2020 Aquatic Effects Monitoring Program Annual Report	

1. Purpose

The purpose of this Report is to present to the Mackenzie Valley Land and Water Board (MVLWB/the Board) the 2020 Aquatic Effects Monitoring Program (AEMP) Annual Report submitted by De Beers Canada Inc. (De Beers) to fulfill Part I, Condition 5 of Water Licence (Licence) MV2005L2-0015.

2. Background

- September 24, 2014 – Issuance of Licence MV2005L2-0015;
- May 3, 2021 – 2020 AEMP Annual Report received;
- July 7, 2021 – 2020 AEMP Annual Report review commenced;
- September 2, 2021 – Extension request to reviewer deadline received and granted by Board staff;
- September 3, 2021 – Original deadline for reviewer comments and recommendations;
- September 10, 2021 – Reviewer comments and recommendations due and received;
- September 24, 2021 – Responses due and received;
- **October 28, 2021 – 2020 AEMP Annual Report presented to the Board for decision**; and
- September 30, 2028 – Expiration of Licence MV2005L2-0015.

3. Discussion

History of AEMP Submissions

The Board approved Version 5 of the AEMP Design Plan for the Gahcho Kué Mine on December 3, 2015 (attached). In 2019, De Beers was required to complete an Aquatic Effects Re-evaluation Report as well as an updated AEMP Design Plan, if changes were required. De Beers submitted the Aquatic Effects Re-evaluation Report and an updated AEMP Design Plan (Version 6) on December 13, 2019. The review comment and proponent response due dates were extended multiple times due to complexity of these

AEMP submissions as well as the COVID-19 pandemic. In addition, De Beers applied to amend Licence MV2005L2-0015 on March 10, 2020. The 2020 amendment application included proposed changes to Effluent Quality Criteria and site-specific water quality objectives, which might have had implications on the AEMP benchmarks in the AEMP Design Plan. During the Technical Session for the 2020 Licence amendment proceeding, all Parties agreed to a technical workshop to discuss the proposed changes to the AEMP Design Plan which would enable De Beers to gather feedback. MVLWB facilitated this AEMP workshop that was held November 17 to 19, 2020.

Several Information Requests were generated at the workshop and De Beers provided responses on January 11, 2021; reviewer comments were received on February 10, 2021, and responses from De Beers were received on March 5, 2021. The Board denied the AEMP Design Plan Version 6 on April 8, 2021, and required De Beers to submit a revised AEMP Design Plan in accordance with comments and commitments made during the review. De Beers submitted a revised AEMP Design Plan (Version 6.1) on May 14, 2021. The Board interim approved Version 6.1 on August 19, 2021, requiring resubmission to address comments received and commitments made during review, with required updates to be confirmed for conformity by Board staff. De Beers submitted Version 6.2 on September 20, 2021, to address the requested changes as directed and written confirmation of conformity from Board staff was issued on September 22, 2021.

Although the item before the Board for a decision is the 2020 AEMP Annual Report, this history related to the AEMP Design Plan is provided to remind the Board that an updated AEMP Design Plan has been approved. This is relevant because due to the delay in the approval of the updated AEMP Design Plan (Version 6.2), the 2020 AEMP Annual Report was completed in accordance with requirements outlined in the AEMP Design Plan Version 5. The updated AEMP Design Plan (Version 6.2) was completed in accordance with the MVLWB/GNWT *Guidelines for Aquatic Effects Monitoring Programs* and outlines the monitoring of the aquatic effects at the Gahcho Kué Mine. Board staff acknowledge that this 2020 AEMP Annual Report was completed according to the previous requirements under AEMP Design Plan Version 5. In future, the AEMP Annual Report will be completed according to the updated AEMP Design Plan (version 6.2) or any updated versions.

Authorization Requirements

The 2020 AEMP Annual Report is required to fulfill Part I, Condition 5, and Schedule 6, Condition 3 of Licence MV2005L2-0015 (Table 1). The 2020 AEMP Annual Report is also required to be in accordance with the Board's Directives from previous AEMP Annual Reports (see attached 2019 AEMP Annual Report) (Table 2).

Description of Submission

On May 3, 2021, De Beers submitted the 2020 AEMP Annual Report. The Report includes concordance tables for Board directives from previous AEMP Annual Reports (Table 1A-1 in the attached 2020 AEMP Annual Report).

4. Comments

Analysis of Adequacy of Submission

Board staff conducted a completeness check and adequacy analysis based on the requirements in accordance with Schedule 6, Condition 3 of the Licence MV2005L2-0015 (Table 1).

Table 1: Board staff Analysis on the 2020 AEMP Annual Report

Schedule 6, Condition 3: The AEMP Annual Report referred to in Part I, Condition 5 of this Licence shall include, but will not be limited to, the following		Board staff analysis of the adequacy of the Report in addressing the component
a)	A plain language summary of the major results obtained in the preceding calendar year and a plain language interpretation of the significance of those results	Adequate. A Plain Language Summary was provided on pages ii to xv of the Report. Board staff noted that this section could benefit from inclusion of overview map(s) and figures to better meet the goal of simplifying and summarizing the program (a review comment was submitted).
b)	A summary of activities conducted under the AEMP	Adequate. Provided in Section 2.
c)	An update of the Project development activities and any accidents, malfunctions, or spills within the report time frame that could influence the results of the AEMP	Adequate. Provided in Sections 3.2 and 3.4. There were 13 reportable spills occurred on land and within the controlled area boundary of the Mine. No negative effects to receiving surface waters were associated with these spills.
d)	Tabular summaries of all data and information generated under the AEMP in an electronic and printed format acceptable to the Board	Adequate. Raw data for reported components were provided in various appendices.
e)	An interpretation of the results, including an evaluation of any identified environmental effects that occurred as a result of the Project	Adequate. De Beers provided discussions for each AEMP component including hydrology, water quality, sediment quality, plankton, benthic invertebrates, fish habitat and community, Traditional Knowledge monitoring, and plume delineation in sections 4 to 9, and 13 of the Report. Reviewer comments and recommendations were received on the interpretation of results (see public review section of this staff report).
f)	A comparison of predicted mixing and dilution of effluent in Lake N11 and Area 8 in comparison to monitoring data	Adequate. The report included comparison to Environmental Impact Statements (EIS) predictions for water quality in section 5.4.2.6 (Lake N11), 5.4.3.6 (Area 8), and Section 13 (plume delineation).
g)	An analysis that integrates the results of individual monitoring components collected in a calendar year and describes the ecological significance of the results	Adequate. Section 14 provides a weight of evidence analysis by combining all the components.

h)	A comparison of monitoring results to Action Levels as set in the AEMP Design Plan	Adequate. Assessment of Action Levels was provided for each component in sections 5 to 9 of the report. Low Action Levels were triggered for Toxicological Impairment and Nutrient Enrichment. Low and moderate Action Levels were triggered for Fish Habitat and Community. Reviewer comments and recommendations were received on the AEMP Response Plans for Toxicological Impairment and Nutrient Enrichment as well as Fish Habitat and Community under separate review and are not considered further in this staff report.
i)	An evaluation of the overall effectiveness of the AEMP to date	Adequate. Considerations of recommended changes to the AEMP design were considered within each component in sections 4 to 9. No recommendations were provided. Board staff note that the updated AEMP Design Plan (version 6.2) was approved by the Board on August 19, 2021 pending updates for a staff conformity review; this was completed on September 22, 2021.
j)	Recommendations for refining the AEMP to improve its effectiveness as required	
k)	Any other information specified in the approved AEMP Design Plan or that may be requested by the Board before November 1 of any year	De Beers included concordance tables to identify the Board directives from the 2016 to 2019 AEMP Annual Reports.

Table 2: Board staff Analysis of the Board Directives from the 2019 AEMP Annual Report

Board Directives for future AEMP Annual Reporting		Comment ID	Staff Conformity Comment
1.	Address commitment to investigate the potential 2019 dust deposition anomaly by using 2020 data and report the findings.	ENR-5	Complete. Supporting Environmental Data, Section 3.4.2.5.1 (which is present twice). This section reports the 2020 findings compared to 2019 and suggests that the monitors may be located too far away to pick up particulates from the core working area. De Beers states that further monitoring will be carried out to confirm trends noted in 2019 and 2020. It is not clear if dust station locations should be moved or not (review comment submitted for clarification).
2.	Include the hydrological comparison to EIS predictions.	ENR-12	Complete. Hydrology information included in Section 4.3.3 and 4.4.1.
3.	Ensure consistent wording for the low action level for Toxicological Impairment.	ENR-15	Complete. Water Quality information included in Sections 5.4.2.7, 5.4.3.7, and 5.4.4.7.
4.	Provide discussion on extractable petroleum hydrocarbon.	ENR-20	Complete. Petroleum hydrocarbon information included in Supporting Environmental Data, Section 3.4.3.3. None of the petroleum hydrocarbon fractions (i.e., C10-C19, C19-C32

			and C10-C32) were detected in the samples collected in 2020. Text included to address Directive 4 from the 2019 AEMP Annual Report. Note that no reportable spills have occurred in the vicinity of Lake N11 to date.
5.	Consider changing the size or shape of symbol for censored data.	ENR-22	Complete. Updated Water Quality figures in Appendix 5F, and Sediment Quality figures in Appendix 6D.
6.	Continue to monitor sediment silver concentrations in Lake N11 on an annual basis and take into consideration the elevated baseline detection limits when interpreting BACI analysis results.	ENER-23	Complete. Information included in Sediment Quality, Section 6.4.2.3.3 includes discussion regarding high detection limit employed during the baseline years.
7.	Consider providing a summary table for each endpoint, the units, and the transformation applied in response to ENR-32.	ENR-32, 33	Complete. Included in: Water Quality Appendix 5E; Sediment Quality Appendix 6A; Plankton Appendix 7C and 7D; and, Benthic Invertebrates, Appendix 8A.
8.	Define x in the legend of the plots as statistical outliers.	ENR-34	Complete. Included in: Water Quality Appendix 5F; Sediment Quality Appendix 6D; Plankton Appendix 7C and 7D; and, Benthic Invertebrates Appendix 8A.
9.	Provide additional literature from the NWT region to provide more localize analysis of mercury concentrations on site.	ENR-45	Not required in this report because the next Fish Tissue Chemistry program in Lake D2/D3 will be conducted in 2022. This directive will be addressed in the 2022 AEMP Annual Report (Section 11).
10.	Provide coordinates for the Lake Station on Map.	MVLWB-5	Complete. Coordinates included in Hydrology Section 4, Map 4.1.1.

5. Public Review

By September 10, 2021, comments and recommendations on the 2020 AEMP Annual Report were received from two Parties and Board staff:

- Government of the Northwest Territories – Department of Environment and Natural Resources (GNWT-ENR); and
- Environment and Climate Change Canada (ECCC).

De Beers responded by September 24, 2021. The Review Summary and Attachments (attached) presents the comments received through this review.

No significant concerns were raised during this review, and Board staff suggest De Beers responded appropriately and completely to all comments. The remaining outstanding issues are administrative updates and relatively minor points of clarification including minor wording modifications and typographical corrections. Board staff have summarized recommendations for Board directives for the Board's consideration in Table 3.

Table 3: List of Board Directives for the 2020 AEMP Annual Report

Item	Revisions to 2020 AEMP Annual Report	Reference
a)	De Beers to include a conformity table listing the requirements of Schedule 6, condition 5, in an updated version of the 2020 AEMP Annual Report.	MVLWB-1
b)	De Beers to include Maps 2.5-1 and 2.5-2 to the Plain Language Summary, in an updated version of the 2020 AEMP Annual Report.	MVLWB-2
c)	De Beers to correct the text on p. 3-10 regarding mean annual wind speed from 4.57 m/s to 4.62 m/s, as reported in Table 3.4-4, in an updated version of the 2020 AEMP Annual Report.	MVLWB-5
d)	De Beers to correct the sub-heading numbering for Vegetation and Soils Monitoring Program - Dustfall Transect from Section 3.4.2.5.1 to Section 3.4.2.5.2, in an updated version of the 2020 AEMP Annual Report.	MVLWB-6
e)	De Beers to correct the text on p. 5-16 regarding significant BACI results for water quality from 14 parameters to 15 parameters, as reported in Tables 5.4-3 and 5.4-4, in an updated version of the 2020 AEMP Annual Report.	MVLWB-10
f)	De Beers to correct the text on p. 7-56 regarding zooplankton comparisons from “Comparisons of the 2019 zooplankton community…” to “Comparisons of the 2020 zooplankton community…”, in an updated version of the 2020 AEMP Annual Report.	MVLWB-11
g)	De Beers to correct the error in footnote (b) of Table 5.4-10 to read “The BA x CI interaction term must be significant in all simple effects comparisons between 2020 and baseline years for a "Yes" Classification.", in an updated version of the 2020 AEMP Annual Report.	GNWT-ENR-8
h)	De Beers to correct the error in footnote (b) of Table 7.4-1 to read "When calculating lake-wide means/medians for core lakes in 2020, the arithmetic mean was used when the 2020 data were determined to be normally distributed based on significance of the Shapiro-Wilk test (P<0.05). The geometric mean was used to estimate the lake-wide mean in 2020 when normality could be achieved by applying a log-transformation to the data. The median was used to provide an estimate of central tendency in cases where normality could not be achieved by applying a transformation to the 2020 data.”, in an updated version of the 2020 AEMP Annual Report.	GNWT-ENR-10
i)	De Beers to correct the error in footnote (b) of Table 7.4-5 to read "When calculating lake-wide means/medians for core lakes in 2020, the arithmetic mean was used when the 2020 data were determined to be normally distributed based on significance of the Shapiro-Wilk test (P<0.05). The geometric mean was used to estimate the lake-wide mean in 2020 when normality could be achieved by applying a log-transformation to the data. The median was used to provide an estimate of central tendency in cases where normality could not be achieved by applying a transformation to the 2020 data.”, in an updated version of the 2020 AEMP Annual Report.	GNWT-ENR-12
j)	De Beers to update the text in Section 8.3.1.1.1 (p. 8-6) to read “The available DO profile data for Area 8 suggested that under-ice DO concentrations may be lower, overall, during recent AEMP monitoring compared to the baseline years. This trend may have been influenced to some extent by regional weather and precipitation patterns, which appear to be affecting DO conditions both in Area 8 and the	GNWT-ENR-13

	reference lakes (e.g., similar under ice DO concentration trends between years were observed in Area 8 and the reference lakes in 2016 and 2017 when notably lower DO concentrations were observed compared to 2020 due to very warm and dry conditions in these years compared to the regional average; Appendix 8C). However, weather and precipitation patterns do not appear to fully explain the observed trend in DO in Area 8. Water management activities occurring on site are a likely factor affecting DO regime in Area 8 during AEMP monitoring years (Appendix 8C).", in an updated version of the 2020 AEMP Annual Report.	
k)	De Beers to update the text in Section 9.3.2.2 (p. 9-14) to read "Although the 2020 study design captured both adult and YOY Slimy Sculpin, the capture probability may have differed between size classes. The year-over-year decreases in YOY captures are attributed to a decrease in capture efficiency due to influences of higher water levels in 2020 and an overall decrease in sampling effort in 2020 versus 2019. There was a decrease in the spatial extent of sampling in each stream and a related decrease in electrofishing time in each stream due to a shift from single-pass sampling in favour of a multi-pass survey design.", in an updated version of the 2020 AEMP Annual Report.	GNWT-ENR-16
l)	De Beers to update the text in Section 15 (p. 15-4) to say "…below 75% of AEMP benchmarks…" instead of "…within 75% of AEMP benchmarks…", in an updated version of the 2020 AEMP Annual Report.	GNWT-ENR-17
m)	De Beers to update the text in Appendix 6B, Section 6B.2.2.1 and/or 6B.2.2.3 (p. 6B-2) to include the additional information regarding the detection limit comparison for Total Kjeldahl Nitrogen (TKN) (i.e., that all results obtained for TKN in 2020 were above the sample-specific detection limit (DL) and ranged from 1.7 to 7.2 times the DL.", in an updated version of the 2020 AEMP Annual Report.	GNWT-ENR-18
n)	De Beers to update Table 8A-5 to correct the rounding in the summary statistics for the diversity and evenness endpoints, in an updated version of the 2020 AEMP Annual Report.	GNWT-ENR-20

6. Security

The status of security for this Project will not be affected by the Board's decisions related to the 2020 AEMP Annual Report.

7. Conclusion

Board staff conclude that the 2020 AEMP Annual Report, as submitted, is in conformity with the requirements of Licence MV2005L2-0015, however, Board staff recommend the 2020 AEMP Annual Report be revised and re-submitted to reflect updates identified during the review. The Board will need to determine whether the information requested shall be submitted and reviewed prior to approval, or whether the Licence provides enough flexibility for staff conformity of revisions.

8. Recommendation

Board staff recommend the Board to **make a motion to approve the 2020 Aquatic Effects Monitoring Program Annual Report as required by Water Licence MV2005L2-0015 as an interim submission.** De

Beers Canada Inc. is required to submit a revised submission in accordance with comments and commitments made during this review by **December 10, 2021**, for confirmation of conformity from Board staff.

A draft decision letter is attached.

9. Attachments

- Hyperlinked registry page for Licence MV2005L2-0015
- 2020 AEMP Annual Report
- 2020 AEMP Annual Report – Raw Data
- 2019 AEMP Annual Report Board Decision Letter
- AEMP Design Plan Version 6.2
- Review Summary and Attachments
- Draft Decision Letter from the Board

Respectfully submitted,

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Reviewer Comments and Proponent Responses

Project: De Beers Gahcho Kué
Board: Mackenzie Valley Land and Water Board
Organization: De Beers Canada Inc. - Gahcho Kué

No	Topic	Reviewer Comment	Reviewer Recommendation	Proponent Response	Board Decision
MVLWB - Katherine Harris					
1	Concordance Table	Board staff note that De Beers has provided a Concordance Table in Appendix A, but this only includes relevant MVLWB directives. Board staff remind De Beers that MVLWB2005L2-0015 Schedule 6, Condition 3 includes a list of items that the AEMP Annual Report must include. These items should be included in the Concordance Table and include references to the relevant sections of the report.	De Beers to provide an updated Concordance Table that includes the requirements outlined in MVLWB2005L2-0015 Schedule 6, Condition 3.	Although the AEMP addresses the requirements of Schedule 6, Condition 3 of Water Licence MV2005L2-0015, the purpose of the Concordance Table is to confirm that all relevant Board Directives have been addressed in the report. However, the requirements outlined in Schedule 6, Condition 3 of the Water Licence MV2005L2-0015 will be added to this table.	The Board notes that the requirements of MV2005L2-0015 Schedule 6, Condition 3 were confirmed as being met through a staff conformity check prior to distributing the report for public review. However, it is a requirement to include a conformity table to specify applicable sections that contain the information outlined in the Licence requirements and not just Board directives. Board notes that this is standard practice and that De Beers has included a conformity table in other documents submitted for review. *The Board directs De Beers to include a conformity table for Licence requirements in an updated version of the 2020 AEMP Annual Report.*
2	Plain Language Summary	Board staff note that it would be very helpful if some maps and figures were provided to add context to the Plain Language Summary. This would really help this section to achieve its goals for simplifying and summarizing the program. Without it, references to lakes and watersheds around and impacted by the Project are hard to understand.	De Beers to consider incorporating maps and figures to help add context to the Plain Language Summary in future versions of the AEMP Annual Report.	De Beers seeks for clarification if this recommendation is based on the a specific comment from the Indigenous parties, or based on the Board staff's interpretation. The purpose of the Plain Language Summary is to summarize and interpret the major results, using plain language. The structure of the Plain Language Summary as presented achieves the requirement as stated in the Water Licence (Schedule 6, Part I, Condition 3,	The Board notes De Beers' commitment to including maps in the Plain Language Summary and that it should help provide information to help orient readers regarding location of various areas referred to in the text. Board also acknowledges De Beers' point regarding the length and technical level of the Plain Language Summary becoming onerous if all

No	Topic	Reviewer Comment	Reviewer Recommendation	Proponent Response	Board Decision
				item a) of "A plain language summary of the major results obtained in the preceding calendar year and a plain language interpretation of the significance of those results". De Beers will add Maps 2.5-1 and 2.5-2 to address Board Staff's comment related to reference to lakes and watersheds. However, adding any other figures to a Plain Language Summary would considerably expand the length of this section, and would introduce detailed technical material that would make it more difficult to read, particularly for non-technical readers.	relevant figures were to be included but suggest that De Beers is missing what Board staff have suggested for consideration. It is not the intention to reproduce all the technical figures within the Plain Language Summary, but rather to create Plain Language Figures that illustrate the information being discussed to help provide a visual representation of the results. Board reiterates that inclusion of select maps and illustrative figures could help this section better achieve its goal for simplifying and summarizing the program, but acknowledge that this is not a requirement. *The Board directs De Beers to include Maps 2.5-1 and 2.5-2 in the Plain Language Summary in an updated version of the 2020 AEMP Annual Report.*
3	Plain Language Summary	Board staff note that there is a high level statement on p. xv regarding the specific responses being dependent on the type and magnitude of the observed effects and that these response actions are submitted in AEMP Response Plans following the submission of the AEMP Annual Report. While this is generally true, there is no mention of the AEMP Response Plan for Fish Habitat and Community that was submitted on February 5, 2021, which is well in advance of the 2020 AEMP Annual Report submission in May 2021. There is also no mention of an anticipated time for	De Beers to update the Plain Language Summary to include information related to Response Plan submissions associated with the 2020 AEMP Annual Report.	As stated in response to MVLWB-2, the intent of the Plain Language Summary is to summarize and interpret the major results. Per the Water Licence (Schedule 6, Part I, Condition 3, item h), the annual report included a comparison of monitoring results to the approved Action Levels. The Plain Language Summary lists the results of those comparisons, and is thus consistent with the requirements in the Water Licence for the AEMP Annual Report. The responses to the Action Level exceedances are documented in the associated AEMP Response Plans, which is also consistent with the requirements of the Water Licence and the approved AEMP	The Board acknowledge that the summary of results is provided in the Plain Language Summary as stated and the triggering of Action Levels has been identified. While De Beers is correct that the requirements of the Plain Language Summary have been met, it seems somewhat illogical not to include information to inform readers of the Plain Language Summary that Response Plans have or will be submitted to the Board. Inclusion of this information appears to be a relatively minor addition to effectively close the loop on the triggered Action

No	Topic	Reviewer Comment	Reviewer Recommendation	Proponent Response	Board Decision
		submission of the AEMP Response Plan for Toxicological Impairment and Nutrient Enrichment (which included the Drinking Water Low Action Level exceedance in Area 8). De Beers provided an anticipated submission date of June 28, 2021 in the Action Level exceedance notification letter submitted to the Board on April 16, 2021. Including this information in the Plain Language Summary is relevant as it informs reviewers what steps have occurred or are planned to be completed in response to the Action Level triggers.		Design Plan. This is stated in the Plain Language Summary; the details of submission dates are provided in the relevant sections of the report.	Levels. In addition, Board notes that having a statement regarding whether further information regarding the Action Level trigger is including within the AEMP Annual Report or will be a future submission as an AEMP Response Plan is important information for readers of the Plain Language Summary, particularly once Response Plans are no longer required for triggered Low Action Levels. Board acknowledges that this is not a formal requirement, but suggest that De Beers consider this in future AEMP Annual Reports.
4	Plain Language Summary	A Moderate Action Level for flow mitigation was triggered for Arctic Grayling in 2020. The absence of Arctic Grayling in the area downstream of Area 8 is noted, but there is no further information to provide context to this result (e.g., was fish passage possible, is the absence of Arctic Grayling significant, etc.). Board staff acknowledge that more information is provided in Section 9 (Fish Habitat and Community), but should also be included in the Plain Language Summary.	De Beers to update the Plain Language Summary to include information related to the Moderate Action Level for flow mitigation for Arctic Grayling.	More information about the absence of Arctic Grayling in the area downstream of Area 8 is already provided in the Plain Language Summary, under the heading "Fish Habitat and Community".	Adequate response. The Board acknowledges that the information for Area 8 was provided under the heading Fish Habitat and Community.
5	Section 3.4.2.3 Wind Speed and Direction	There appears to be a discrepancy in the reported mean annual wind speed. Text on p. 3-10 states that the mean annual wind speed in 2020 was 4.57 m/s, but Table 3.4-4 shows a mean annual wind speed of 4.62 m/s. Which number is correct?	De Beers to confirm the correct mean annual wind speed for 2020.	The mean annual wind speed of 4.62 m/s in Table 3.4-4 is the correct value.	Adequate response. *The Board directs De Beers to correct the error in the text on p. 3-10 regarding mean annual wind speed as per the Proponent response in an updated version of the 2020 AEMP Annual Report.*
6	Section 3.4.2.5 - Dust	There is a duplication in sub-heading number. Section 3.4.2.5.1 is associated	De Beers to confirm sub-heading numbering under	Vegetation and Soils Monitoring Program - Dustfall Transect is Section 3.4.2.5.2.	Adequate response.

No	Topic	Reviewer Comment	Reviewer Recommendation	Proponent Response	Board Decision
	Deposition	with both Air Quality - Dust fall Transect and Vegetation and Soils Monitoring Program - Dustfall Transect. The latter should be 3.4.2.5.2.	Section 3.4.2.5.		*The Board directs De Beers to correct the error in sub-heading numbering as per the Proponent response in an updated version of the 2020 AEMP Annual Report.*
7	Section 3.4.2.5 - Dust Deposition	De Beers reported the 2020 dust fall findings compared to those from 2019 and seem to suggest that the dustfall monitors may be located too far away to pick up particulates from the core working area. De Beers states that further monitoring will be carried out to confirm trends noted in 2019 and 2020. It is not clear if De Beers has considered whether dustfall station locations should be moved or if additional stations should be added.	De Beers to comment on whether consideration to move or add dustfall station locations to confirm dust deposition results.	Dustfall monitoring is not part of the AEMP. Information related to dust deposition at the Mine is sourced from the Vegetation and Soils Monitoring Program (VSMP) report. There are no plans to move or add dustfall station locations at this time. Further discussion on the dustfall monitoring program can be found in the annual VSMP reports.	The Board acknowledges that dustfall monitoring is not a requirement of the AEMP, however, De Beers includes dustfall monitoring results as supporting information in the AEMP; therefore, comments related to such supporting information or questions seeking clarification of information provided may arise. Board notes the response provided has clarified that there are no plans to relocate existing stations or add additional stations to the existing dustfall monitoring program.
8	Section 3.4.4.1 Water Temperature	No water temperature was recorded in Lake N11 between January and August 2020 because of a data logger malfunction. It is understood that COVID-19-related travel restrictions were in place, but were there other contributing factors to explain why this malfunction went undetected for such an extended period of time, as well as if any changes in sampling protocol have been made to avoid this issue in future?	De Beers to comment on the cause(s) for the extended delay in detecting the malfunctioning water temperature data logger in Lake N11 and what, if any, changes to sampling protocol have been made to help avoid this from occurring in the future.	The lake level and water temperature sensor at Lake N11 mulfunctioned and have not been repaired during an extended period due to multiple reasons: 1) due to the electrical grounding limitation and the local geography, the radio transmitters were often damaged during thunder storms in the summer months (e.g. 8 out of 10 water level monitoring transmitters were destroyed during one thunder storm in July 2021); 2) ice forming and melting during shoulder seasons (early winter and early spring) can often damage the level sensors installed in the waterbodies; and 3) due to COVID restrictions and supply shortage, parts for repairs take weeks if not months to arrive.	The Board acknowledges the reasons provided but note that the example provided July 2021 is not relevant to the 2020 AEMP Annual Report. Board further notes that this is unlikely a typographical error in the response given the lack of functional temperature dataloggers well before July. Regardless, Board notes that 2020 was a challenging year and that it appears, based on the response, that 2021 likely had similar challenges related to the temperature dataloggers. The Board further notes that this is supporting information and trust that De Beers will continue to endeavor to collect this supporting data as per the approved AEMP Design Plan.

No	Topic	Reviewer Comment	Reviewer Recommendation	Proponent Response	Board Decision
9	Section 5.4.2.4.1 Ice-Cover Lake N11(Water Quality)	In Table 5.4.1 Summary of BACI Results in Lake N11 Ice-cover Season, field specific conductivity is listed as showing an overall decreasing response pattern; however, this does not seem consistent with results for other related components (e.g., chloride, sulphate, nitrate, calculated TDS) or the results presented in Appendix Figure 5-E2, which appears to indicate an overall increasing pattern. Could De Beers provide more information to explain this?	De Beers to provide further information related to the reported overall decreasing pattern in field specific conductivity and why this reported pattern appears to differ from patterns observed in related parameters and data presented in Appendix Figure 5-E2.	Although specific conductivity increased in 2020, the BACI analysis did not identify a significant increasing effect relative to the reference lake. The BACI figures can be deceptive as the data are presented in their transformed form. The decreasing press effect compared to East Lake was significant but of small magnitude (Table 5E-1) and the pulse effect, though significant overall, was not significant compared to 2011, resulting in no significant pulse effect compared to baseline. Specific conductivity has increased in both lakes compared to baseline. Although the BACI analysis resulted in a significant BA x CI effect, the magnitude was only -6.3%. It is likely there will be significant effects in 2021 should the elevated concentrations remain. In comparison to a parameter like chloride, after transformation, chloride concentrations in Lake N11 and East Lake were similar under baseline conditions but the difference between the parameters has increased in operations. In contrast, specific conductivity in Lake N11 and East Lake were not similar to each other after transformation in 2011, then became similar and the current difference between the lakes is similar to that in baseline. The differences in the trends leads to the different BACI results between the two parameters.	Adequate response.
10	Section 5.4.2.4.2 Open-Water Lake N11 (Water Quality)	There appears to be a small discrepancy in the BACI results reported for the open-water season in Lake N11. Text on p. 5-16 lists 14 parameters in Lake N11 as having press or pulse effects compared to both reference lakes and an overall pattern of increasing concentrations in the open-water season, but Table 5.4-3 lists 15	De Beers to confirm the number of water quality parameters in Lake N11 that exhibited a press or pulse effect compared to both lakes and an overall pattern of increasing concentrations during the open-water season.	This was a typo, it should be 15 parameters as noted in Table 5.4-3 and 5.4-4 not 14.	Adequate response. *The Board directs De Beers to correct the error in the text on p. 5-16 regarding the number of significant BACI results for water quality as per the Proponent response in an updated version of the 2020 AEMP Annual*

No	Topic	Reviewer Comment	Reviewer Recommendation	Proponent Response	Board Decision
		parameters in that category. Is the text or table correct?			*Report.*
11	Section 7.5 Summary and Conclusions - Key Question 2	There appears to be an incorrect date listed in the Key Question 2 summary. Text on p. 7-56 refers to "Comparisons of the 2019 zooplankton community in the core lakes to the reference lakes and baseline conditions…", but this date should be 2020.	De Beers to verify that the date listed on p. 7-56 for the zooplankton community should be 2020.	"Comparisons of the 2019 zooplankton community…." should read "Comparisons of the 2020 zooplankton community…"	Adequate response. *The Board directs De Beers to correct the error in the text on p. 7-56 regarding the date (i.e., change from 2019 to 2020) for the zooplankton comparisons as per the Proponent response in an updated version of the 2020 AEMP Annual Report.*
No	Topic	Reviewer Comment	Reviewer Recommendation	Proponent Response	Board Decision
GNWT-ENR (Environment and Natural Resources) - Mr. Patrick Clancy					
1	2020 AEMP Annual Report Version 1	ENR Cover Letter	ENR Cover Letter		Noted.
2	2020 AEMP Annual Report Version 1	ENR Cover Letter	ENR Cover Letter		Noted.
3	Topic: LGL Limited	ENR retained LGL Limited (LGL) to conduct a review of De Beers Canada Inc.'s (De Beers) 2020 Aquatic Effects Monitoring Program (AEMP) Annual Report for the Gahcho Kué Mine. ENR has extracted and summarized the comments and recommendations from the memorandum and provided them below.	None	Acknowledged.	Noted.
4	Topic: Action Level Assessment – BACI Analysis	In Section 5.2, Table 5.2-1, De Beers describes differences between the 2020 AEMP methods and the 2019 AEMP methods. The Action Level evaluation row states that: "As the ice-cover BACI comparison is made only to East Lake in 2020, the ice-cover Action Level evaluation for this AEMP year only considered lake-wide mean/median greater than normal range or EIS predictions AND lake-wide average	1) ENR recommends that the results of the BACI analysis be included in the Action Level assessment.	The BACI analysis requires both reference lakes to evaluate the presence of an effect. Due to annual and regional changes in reference lakes, historical (including 2019) BACI results cannot be used as surrogates for the current year's results. Although the ice-cover BACI results in 2020 are not applicable for the Actions Levels, any increase above the normal range or EIS prediction and 75% of the AEMP benchmark is sufficient to screen for parameters of concern or ecological	Adequate response. The Board agrees with De Beers that the BACI analysis requires both reference lakes and that inclusion of the single lake BACI results are not applicable to the 2020 Action Level assessment. However, the Board notes that the wording of the approved low Action Level for water quality that was applicable to the 2020 AEMP Annual Report (i.e., AEMP Design Plan Version 5) resulted in a

No	Topic	Reviewer Comment	Reviewer Recommendation	Proponent Response	Board Decision
		concentration exceeding 75% of the AEMP benchmark as a Low Action Level trigger." ENR acknowledges that only one reference lake was sampled during ice-cover conditions in 2020; however, the BACI analysis, conducted using data collected in previous years and the one reference lake, should be considered sufficient to conduct the Action Level assessment.		significance as incorporated by the "or" statement in the Action Levels. The ice-cover BACI results will be used in the 2021 Action Level assessment.	Low Action Level exceedance, which triggered a response action to screen POPCs for ecological significance under ice-covered conditions.
5	Topic: Open-Water Summary of Results	Section 5.4.2.4.2 states that: "The observed change in water quality was incrementally more pronounced in 2020 compared with previous years, likely due to the larger volume of effluent discharged from WMP to Lake N11 in 2019 compared to previous years (De Beers 2020)." It is understood that higher concentrations of parameters measured in ice-cover and open-water conditions in Lake N11 are caused by larger discharge volumes from the Water Management Pond to the downstream environment in 2019. ENR notes that it isn't clear if the concentrations were consistent with the water quality model predictions for 2020.	1) ENR recommends confirming if the concentrations of parameters that had a significant press and/or pulse BACI effect (i.e., field specific conductivity, calculated TDS, chloride, fluoride, sulphate, total potassium, nitrate, and strontium, field pH, total ammonia, and thallium) were consistent with the water quality model projections for the year 2020. If not, ENR recommends justifying the deviations from the model predictions.	Seasonal lake-wide average concentrations of these parameters were compared to the 2018 water quality modelling predictions in Table 5.4-5. When compared to the updated water quality modelling predictions for 2020 from the 2020 Water Licence amendment, all lake-wide average concentrations were within model predictions with the exception of ice-cover chloride and zinc for Lake N11. Please see response to ECCC-5 for an explanation of why chloride and total zinc concentrations in Lake N11 were greater than model predictions.	Adequate response.
6	Topic: Declining DO Concentrations in Area 8	Low dissolved oxygen (DO) concentrations (discussed in Sections 5.4.3.1 and 14.3.1.2.2) are a recurrent issue during ice-cover conditions in Area 8 but is not observed in any of the reference lakes. This period of anoxia is	1) ENR recommends that De Beers identify potential monitoring programs (or special studies) to explore the potential causes of declining DO concentrations in Area 8.	As stated in response to GNWT-ENR-2 from the 2020 AEMP Response Plan for Toxicological Impairment and Nutrient Enrichment, De Beers agrees that if low under-ice DO is confirmed as a Mine-related effect in Area 8 in 2021, then a special study	Adequate response. The Board notes that the 2020 AEMP Response Plan for Toxicological Impairment and Nutrient Enrichment was approved by the Board on October 7, 2021. The Board required De Beers to resubmit the

No	Topic	Reviewer Comment	Reviewer Recommendation	Proponent Response	Board Decision
		recognized as potentially having negative impacts on the benthic invertebrate community in Area 8 and has the potential for adverse effects on the fish community. No recommendations for future monitoring to confirm the potential cause is provided.		could be developed as a response action. As stated in response to GNWT-ENR-4 from the 2020 AEMP Response Plan, further studies on the spatial and seasonal extent of low DO in Area 8 would be considered if one of the following is met: 1) analysis of DO data collected 0.5 m above lake bottom confirms that there is sustained reduction in DO, and benthos richness remains reduced relative to reference lakes as indicated by BACI analysis results, or 2) data review suggests the amount of fish habitat is decreasing, or there is potential for effects to the fish community.	proposed low dissolved oxygen special study triggers as a standalone update to the AEMP Design Plan version 6.2, which will be subject to review and Board approval through a separate process. As such, this item does not need to be considered further under the 2020 AEMP Annual Report.
7	Topic: Comparison to Benchmarks and Guidelines	Section 5.4.3.2 mentions that no exceedances of Canadian Drinking Water Quality Guidelines (CDWQG) were measured in Area 8. However, section 5.4.3.7 reports that "A Low Action Level for manganese (ice-cover) was triggered on the basis that the maximum concentration was greater than 75% of the CDWQG (Table 5.4-16).	1) ENR recommends discussing the case of manganese in section 5.4.3.2, since this parameter is triggering a Low Action Level.	Section 5.4.3.2 discusses exceedances of AEMP benchmarks and guidelines; ice-cover manganese concentrations in Area 8 did not exceed any benchmark or guideline and therefore do not need to be discussed in Section 5.4.3.2.	Adequate response. The Board notes that in Area 8, the concentration at one station during ice-covered conditions was equal to the CDWQG and that the Low Action Level for drinking water was triggered because this maximum concentration was greater than 75% of the CDWQG. This, however, is different than exceeding the actual CDWQG, which is what is discussed in Section 5.4.3.2.
8	Topic: Typographical Error	Table 5.4-10 includes the following: "Note: b) The BA x CI interaction term must be significant in all simple effects comparisons between 2019 and baseline years for a "Yes" Classification".	1) ENR recommends that De Beers correct the noted typographical error.	Footnote b of Table 5.4-10 should read "The BA x CI interaction term must be significant in all simple effects comparisons between 2020 and baseline years for a "Yes" Classification."	Adequate response. *The Board directs De Beers to correct the error in footnote (b) of Table 5.4-10 as per the Proponent response in an updated version of the 2020 AEMP Annual Report.*
9	Topic: Open-water BACI Effects	For a number of parameters having a significant press and/or pulse BACI effect in open-water conditions in Area 8 (i.e., Field Specific Conductivity, Total Dissolved Solids (Calculated), Chloride, Potassium, Total Nitrogen, Barium and Nickel) an exponential increase can be	1) ENR recommends discussing the exponential increase in Field Specific Conductivity, Total Dissolved Solids (Calculated), Chloride, Potassium, Total Nitrogen, Barium and Nickel in the	When seasonal lake-wide average parameter concentrations in 2020 are compared to the updated water quality modelling predictions for 2020 from the 2020 Water Licence amendment, multiple parameters in Area 8 exceed the modelled predictions for 2020 (i.e., calculated total dissolved solids,	Adequate response.

No	Topic	Reviewer Comment	Reviewer Recommendation	Proponent Response	Board Decision
		observed since 2016. It isn't clear if the increases follow the projections from the water quality model presented in Golder (2020).	context of the projected concentrations in the water quality model.	sulphate, ammonia, cobalt, and manganese in ice-cover and calculated total dissolved solids, fluoride, phosphorus, aluminum, arsenic, boron, cobalt, iron, and uranium in open-water). There are three possible reasons that the model is underpredicting concentrations in Area 8: 1) The model results are sensitive to the timing of activities and volumes of water on the mine site. The 2020 Water Licence Amendment water quality model was updated with existing site data to the end of 2019. As a result, the timing of activities and the volumes of water on the mine site may not be representative of actual activities and volumes of water on the mine site in 2020. Some examples include: average precipitation and groundwater flow were used in the model, not the actual values that occurred in 2020; and the timing of downstream flow mitigation in the model does not match the timing of downstream flow mitigation on the mine site in 2020. Small variations in actual annual mine water management, while within the scope of the mine plan for the entire operations phase, can affect the model predictions for individual years. If the model was updated with the actual conditions in 2020, then model predictions for TDS, fluoride, total aluminum, total boron, and total uranium would better match monitoring data. 2) During the ice-cover period, the model results may be under-predicting concentrations in Area 8 for TDS and sulphate due to differences in model assumptions (e.g., ice thickness or the rate of ice formation). 3) A number of parameters in the monitoring	

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				data from Area 8 have concentrations that are greater than concentrations in Lake N11 (e.g., total phosphorus, arsenic, cobalt, iron, and manganese). In the 2020 water quality model, concentrations in Lake N11 are always predicted to be greater than concentrations in Area 8 because Lake N11 receives discharge from the water management pond. For the model to predict higher concentrations in Area 8 than Lake N11, another source term (e.g., sediment release or some other as yet identified factor) would need to be added to the Area 8 model. Overall, differences between annual monitoring results and annual model predictions are not unexpected; as committed in the updated AEMP Design Plan Version 6.2, De Beers will compare lake-wide average concentrations in Area 8 and Lake N11 to annual predicted concentration (based on currently approved water quality model predictions) to meet the needs of the Action Level assessment, and if a Low Action Level is triggered, then will investigate and report in the annual report on reasons for deviations from model predictions.	
10	Topic: Typographical Errors	Section 7.4.2.1, Table 7.4-1 states that: "b) When calculating lake-wide means/medians for core lakes in 2019, the arithmetic mean was used when the 2019 data were determined to be normally distributed based on significance of the Shapiro-Wilk test (P<0.05). The geometric mean was used to estimate the lake-wide mean in 2019 when normality could be achieved by applying a log-transformation to the data. The median was used to provide an	1) ENR recommends that De Beers correct the above-noted typographical errors.	Footnote b of Table 7.4-1 should read "When calculating lake-wide means/medians for core lakes in 2020, the arithmetic mean was used when the 2020 data were determined to be normally distributed based on significance of the Shapiro-Wilk test (P<0.05). The geometric mean was used to estimate the lake-wide mean in 2020 when normality could be achieved by applying a log-transformation to the data. The median was used to provide an estimate of central tendency in cases where normality could not be achieved by applying a	Adequate response. *The Board directs De Beers to correct the error in footnote (b) of Table 7.4-1 as per the Proponent response in an updated version of the 2020 AEMP Annual Report.*

No	Topic	Reviewer Comment	Reviewer Recommendation	Proponent Response	Board Decision
		estimate of central tendency in cases where normality could not be achieved by applying a transformation to the 2019 data." ENR notes that the table notes should refer to 2020, not 2019.		transformation to the 2020 data."	
11	Topic: Trophic Status Classification	In previous AEMPs (e.g., De Beers (2020)) both core lakes were considered oligotrophic. In the 2020 AEMP, based on the Trophic State Index, Area 8 seems to be trending toward a mesotrophic status.	1) ENR recommends that De Beers clarify if the trophic status is expected to change in Area 8 from oligotrophic to mesotrophic, and whether this is consistent with EIS predictions. ENR also recommends that the implications of this shift on aquatic life in Area 8 are discussed.	Area 8 is classified as oligotrophic (i.e., between 0.004 and 0.010 mg/L), based on CCME (2004) TP trigger ranges for Canadian lakes, and oligo-mesotrophic based on Vollenweider and Kerekes (1982) and Carlson (1977). The EIS predicted that concentrations of nutrients (i.e., nitrogen and phosphorus) in Area 8 would increase during the operational phase of the Mine. This was not expected to change the trophic status of the lake from oligo-mesotrophic, but was predicted to increase productivity of lower trophic organisms over time. The magnitude of this change was expected to be greater in Lake N11 than in Area 8. Nitrogen concentrations in Lake N11 were higher in 2020 compared to Area 8 and the reference lakes, while phosphorus concentrations were higher in Area 8, but the trophic status of both Area 8 and Lake N11 remained in the range characteristic of oligo-mesotrophic lakes.	Adequate response.
12	Topic: Typographical Error	Section 7.4.5.2, Table 7.4-5 states that: "When calculating lake-wide means/medians for core lakes in 2019, the arithmetic mean was used when the 2019 data were determined to be normally distributed based on significance of the Shapiro-Wilk test (P<0.05). The geometric mean was used to estimate the lake-wide mean in 2019	1) ENR recommends that De Beers correct the noted typographical errors.	Footnote b of Table 7.4-5 should read "When calculating lake-wide means/medians for core lakes in 2020, the arithmetic mean was used when the 2020 data were determined to be normally distributed based on significance of the Shapiro-Wilk test (P<0.05). The geometric mean was used to estimate the lake-wide mean in 2020 when normality could be achieved by applying a log-transformation to	Adequate response. *The Board directs De Beers to correct the error in footnote (b) of Table 7.4-5 as per the Proponent response in an updated version of the 2020 AEMP Annual Report.*

No	Topic	Reviewer Comment	Reviewer Recommendation	Proponent Response	Board Decision
		when normality could be achieved by applying a log-transformation to the data." ENR notes that the table notes should refer to 2020, not 2019.		the data. The median was used to provide an estimate of central tendency in cases where normality could not be achieved by applying a transformation to the 2020 data."	
13	Topic: Typographical Error	Section 7.5 states that "For Lake D2/D3, results of the discrete and depth-integrated water quality sampling are consistent with EIS predictions of an increase in nutrient concentrations in response to rising water levels, although they appear to have reached a plateau in 2019." ENR notes that this sentence should be referring to 2020.	1) ENR recommends that De Beers correct the noted typographical error.	A correction to the text is not required; the sentence is correctly referring to a plateau that was reached in 2019.	Adequate response. The Board notes that the statement in question continues on beyond the text that GNWT-ENR refers to in their comment, to refer to a decrease observed between 2019 and 2020. This is supported by the results presented in Figure 7.4-2. The text is correct as written.
14	Topic: Ice-cover Dissolved Oxygen Conditions	Section 8.3., 1.1.2 states that: "The available DO profile data for Area 8 suggested that under-ice DO concentrations may be lower, overall, during recent AEMP monitoring compared to the baseline years. This trend was not apparent in the reference lakes (Appendix 8C, Figure 8C-2 and 8C-3). The trend in under-ice DO concentrations appears to have been influenced by recent weather and precipitation patterns. In Area 8, water management activities occurring on site may also be a factor affecting DO regime (Appendix 8C)." This statement suggests that regional weather and precipitation patterns have contributed to low under-ice DO	1) ENR recommends that De Beers provide additional detail regarding why weather and precipitation patterns would be differentially affecting Area 8 relative to Lake N11 and the reference lakes.	The intent of the referenced text was not to suggest that weather and precipitation patterns would be differentially affecting DO concentrations in Area 8 relative to Lake N11 and the reference lakes. Rather, that year-to-year variation in weather and precipitation is a likely factor affecting the temporal pattern observed in under-ice DO concentrations in Area 8, as well as regionally. The statement in Section 8.3.1.1.2 should be revised for clarity: The available DO profile data for Area 8 suggested that under-ice DO concentrations may be lower, overall, during recent AEMP monitoring compared to the baseline years. This trend may have been influenced to some extent by regional weather and precipitation patterns, which appear to be affecting DO conditions both in Area 8 and the reference lakes (e.g., similar under ice DO concentration	Adequate response. The Board notes that the proposed revisions clarify the statements made in the 2020 AEMP Annual Report. *The Board directs De Beers to update the text in Section 8.3.1.1.1 (p. 8-6) as per the Proponent response in an updated version of the 2020 AEMP Annual Report.*

No	Topic	Reviewer Comment	Reviewer Recommendation	Proponent Response	Board Decision
		concentrations; however, this effect is not observed in the reference lakes (stated above).		trends between years were observed in Area 8 and the reference lakes in 2016 and 2017 when notably lower DO concentrations were observed compared to 2020 due to very warm and dry conditions in these years compared to the regional average; Appendix 8C). However, weather and precipitation patterns do not appear to fully explain the observed trend in DO in Area 8. Water management activities occurring on site are a likely factor affecting DO regime in Area 8 during AEMP monitoring years (Appendix 8C)."	
15	Topic: Benthic Invertebrate Community Summary Variables	The following is stated: "The lake-wide mean value for Pagastiella density in Area 8 was below the lower bound of the normal range; however, this result should be interpreted with caution. The measure of central tendency used in the normal range comparison was based on a median value of 0 organisms per square metre (org/m2); however, this taxon was not absent from all sampled stations in 2020 (Table 8.3-3)." ENR notes that this could be resolved by presenting the range of values along with the median. Importantly, no Pagastiella were observed in 4 of the 5 samples collected in Area 8 and only 8 were observed in the sample collected from Area 8-L5. This translates to 69 org/m2. It isn't clear why the authors are stating that the result should be interpreted with caution.	1) ENR recommends that this paragraph be revised to indicate that Pagastiella was only observed in one of the five samples collected.	The intent of the referenced text was to point out that although the lake wide median value for Pagatiella density in Area 8 was 0 org/m2, the taxon was not completely absent from the lake in 2020. It is reasonable to caution readers about this result because a median value of 0 org/m2 might suggest to some readers that the taxon had completely disappeared from Area 8. The AEMP monitoring results have shown that the density of this taxon has been spatially and temporally variable in both core and reference lakes, during both the AEMP and baseline sampling periods. The purpose of Table 8.3-3 is to show the comparison of lake-wide average values in Area 8 and Lake N11 to the Normal Range; the range of measured values are provided in Figure 8.3-5 and Table 8A-5.	Adequate response.
16	Topic: KLM Watershed	Section 9.3.2.2 states that: "The decreases in YOY captures are attributed	1) ENR recommends that De Beers revise this statement	Acknowledged. This statement in Section 9 can be revised for clarity: "Although the 2020	Adequate response.

No	Topic	Reviewer Comment	Reviewer Recommendation	Proponent Response	Board Decision
		to a decrease in capture efficiency due to higher water levels in 2020 and a decrease in sampling effort related to a shift from single pass sampling across many locations in favour of multi-pass sampling for adults at selected locations." ENR notes that multi-pass sampling was not proposed to favour adults. Densities from multi-pass methods sample both adults and YOY. Capture probability may vary between sizes classes.	based on the above comment.	study design captured both adult and YOY Slimy Sculpin, the capture probability may have differed between size classes. The year-over-year decreases in YOY captures are attributed to a decrease in capture efficiency due to influences of higher water levels in 2020 and an overall decrease in sampling effort in 2020 versus 2019. There was a decrease in the spatial extent of sampling in each stream and a related decrease in electrofishing time in each stream due to a shift from single-pass sampling in favour of a multi-pass survey design."	*The Board directs De Beers to update the text in Section 9.3.2.2 (p. 9-14) as per the Proponent response in an updated version of the 2020 AEMP Annual Report.*
17	Topic: Summary and Conclusions	Section 15 states that: "However, as also noted for Lake N11, changes in water quality in Area 8 that demonstrated a Mine-related influence continue to have limited ecological relevance because lake-wide means/median parameters concentrations remained within 75% of AEMP benchmarks in 2020." ENR notes that lake wide means/medians remained below 75% AEMP benchmarks for 2020.	1) ENR recommends that De Beers revise this statement as follows: "However, as also noted for Lake N11, changes in water quality in Area 8 that demonstrated a Mine-related influence continue to have limited ecological relevance because lake-wide means/median parameters concentrations remained below 75% of AEMP benchmarks in 2020."	Acknowledged. This statement in Section 15 can be revised to say "below 75% of AEMP benchmarks" instead of "within 75% of AEMP benchmarks".	Adequate response. *The Board directs De Beers to update the text in Section 15 (p. 15-4) as per the Proponent response in an updated version of the 2020 AEMP Annual Report.*
18	Topic: Detection Limits	Section 6B.2.2.1 and 6B.2.2.3 state that: "The laboratory qualified 28 of the 31 results for total Kjeldahl nitrogen (TKN) because their specific DLs were raised above the standard analysis as a result of dilution required to manage elevated test analyte concentrations. Another result had the DL raised due to sample matrix interference (e.g., turbidity)." ENR notes that additional information on the distribution of concentrations relative to the sample-specific detection limits	1) ENR recommends that De Beers include additional information in Section 6B.2.2.3 on how the TKN samples compare to the sample-specific detection limits.	All results obtained for Total Kjeldahl Nitrogen (TKN) in 2020 were above the sample-specific detection limit (DL) and ranged from 1.7 to 7.2 times the DL.	Adequate response. *The Board directs De Beers to update the text in Appendix 6B, Section 6.2.2.1 and/or Section 6B.2.2.3 (p. 6B-2) to include the additional information regarding the detection limit comparison for TKN as per the Proponent response in an updated version of the 2020 AEMP Annual Report.*

No	Topic	Reviewer Comment	Reviewer Recommendation	Proponent Response	Board Decision
		should be provided to support an assessment of the validity of the results.			
19	Topic: Field Observations – Detritus	Appendix 6C.1 states that: "Lake D2/D3 sediments possess a high proportion of organic matter as evidenced by the presence of detritus in the sediment samples, particularly at station D2/D3-L4 in Basin D2. The presence of organic matter and decomposed vegetation has been consistently observed in grab samples obtained from this station and occasionally at D2/D3-L5, also located in Basin D2, during the AEMP, coinciding with elevated total organic carbon (TOC) concentrations measured in the sediment samples at these stations (Appendix 6A; De Beers 2018, 2019, 2020)." ENR notes that it isn't clear whether the detritus is removed from the sediment samples prior to chemical analysis. The sediment samples from Lake D2/D3 appear to be enriched with some metals (zinc and copper) relative to sediments in the core and/or reference lakes as the ratio of these metal concentrations to aluminum concentrations is much greater in sediments from Lake D2/D3 than core and/or reference lakes.	1) ENR recommends that De Beers describe whether detritus is removed from the sediment samples prior to chemical analysis.	Removal of larger organic detritus (e.g., twigs and leaves) from sediment and soil samples is a common practice across different laboratories. If present, larger detritus was removed from samples prior to chemical analysis. The analytical laboratory did not report whether there was larger detritus in any of the samples, or whether such detritus was removed prior to metals analysis. Nevertheless, the field observation of organic detritus in the sample is an indicator of ongoing process of organic matter inputs to sediments and supports the high TOC concentration recorded in the samples.	Adequate response.
20	Topic: Summary Statistics	The diversity and evenness summary statistics are erroneously rounded to zero decimal places.	1) ENR recommends that De Beers correct the rounding in the summary statistics for the diversity and evenness endpoints.	Acknowledged. Table 8A-5 will be revised to correct the rounding in the summary statistics for the diversity and evenness endpoints.	Adequate response. *The Board directs De Beers to update Table 8A-5 as per the Proponent response in an updated version of the 2020 AEMP Annual Report.*
21	Topic:	ENR provides the following references in	None.	Acknowledged.	Noted.

No	Topic	Reviewer Comment	Reviewer Recommendation	Proponent Response	Board Decision
	References	support of this submission: De Beers, 2020. Gahcho Kué 2019 Aquatic Effects Monitoring Program (AEMP) Annual Report. Submitted to the Mackenzie Valley Land and Water Board, May 2020. Yellowknife, NT, Canada. 660 pp. Golder 2020. Gahcho Kué Mine – Water Quality Model Updates: 2020 Water Licence and Land Use Permit Amendment. Prepared by: Golder Associates Ltd. Calgary AB. Prepared for: De Beers Canada Inc. March 2020. 140 pp.			
No	Topic	Reviewer Comment	Reviewer Recommendation	Proponent Response	Board Decision
Environment and Climate Change Canada (ECCC) - Jennifer Sabourin					
1	Cover Letter	N/A	N/A		Noted.
2	Data Gaps	Under-ice data for April 2020 was collected for six lakes (three stations in each lake). Due to the reduction in the sampling scope, the under-ice data for Lake 3 is missing, and the spatial coverage of other lakes was reduced from five stations to three. Reference: - Section 5.2: Methods; Table 5.2-1: Summary of Differences in 2020 Methods Relative to 2019 AEMP and the Currently Approved AEMP Design Plan	ECCC recommends the Proponent provide discussion on how the reduced sample data may affect statistical analyses going forward, and provide commentary on any effect of the 2020 data gaps.	The reduction of 5 stations to 3 in 2020 will not impact the ability to run future statistical analyses, as 3 stations are sufficient to run statistical tests. The missing Lake 3 ice-cover data for 2020 is not expected to impact future BACI results in terms of power, as it represents a single year in a much larger after/control data set.	Adequate response.
3	Highlight Normal Range on Figures	Many of the figures appear to be missing the normal range (shown as a light grey shaded zone on the graphs, where present). Examples of the missing normal range are found in Figure 5F-3 & 4, 5F-9,		We confirmed that the normal range is present and visible on the mentioned plots. If you cannot see the grey band, please try viewing the pdf on a different monitor.	Adequate response. The Board notes that while the normal range is present, in some instances the band is so narrow relative to the scale

No	Topic	Reviewer Comment	Reviewer Recommendation	Proponent Response	Board Decision
		5F-13 & 14, 5F-18, 5F-19, etc. Similarly, several figures in Section 5.4 of the report have shaded gray normal ranges that are not evident, but that may be due to the range being very narrow. It would be useful to have these ranges shown in color, to be able to distinguish them from the gray graph lines.			of the graph and blends with the grid line, that it is almost not visible on the figure (e.g., Figures 5F3, 5F9, 5F12, 5F13, and 5F18 for the Lake N11, and Figure 5F4 for both Lake N11 and Area 8). In such instances, De Beers should include a note to provide the upper and lower normal range bounds for clarity. *The Board directs De Beers to add notes to Figure 5B graphs to provide the upper and lower normal range bounds for figures where the normal range is narrow and easily confused with the graph grid lines in an updated version of the 2020 AEMP Annual Report.*
4	Trend Analysis for Inconclusive Parameter Results	As noted in Section 5.4.2.4.2 (Open-Water), Lake N11 had numerous parameters that showed statistically significant increases based on the BACI analyses and comparisons to the normal range. Ammonia was found to be inconclusive, but taken forward for further analysis. ECCC questions if conducting a trend analysis on inconclusive parameter results would be useful to indicate whether overall changes are occurring. Reference: - Section 5.4.2.4.2: Open-water ; Figures 5.4-19 to 5.4-30	ECCC recommends the Proponent provide a discussion on utility of trend analysis for inconclusive parameter results.	The annual reports incorporate a temporal assessment as part of the before-after control-impact (BACI) statistical design; that is, each report evaluates changes during "after" years compared to "before" years, and compared to changes in reference lakes over time, incorporating all years of baseline sampling and effects monitoring. The BACI design accounts for the possibility that trends within individual core lakes are not reliable indicators of effects, because the potential for long-term change exists throughout the AEMP study area (e.g., due to progressive permafrost degradation resulting from climate change). Therefore, it is the divergence of trends, as evaluated using BACI analysis, that is considered to provide a reliable indication of potential Mine effects, not the trends themselves. Additional trend analysis will not add	Adequate response, however, the Board notes that on p. 5-5 of the updated AEMP Design Plan Version 6.2 (approved September 22, 21) that De Beers states "At some point, the analytical approach is likely to change to comparisons of trends between core lakes and reference lakes, as more *After* years accumulate over time. De Beers will evaluate whether a shift to trend analysis is appropriate in the next Aquatic Effects Reevaluation report." While Board acknowledges that this updated AEMP Design Plan was not approved at the time when the 2020 AEMP Annual Report was written, the response provided implies that there are no alternative options. Although further evaluation of a change in trend analysis approach is

No	Topic	Reviewer Comment	Reviewer Recommendation	Proponent Response	Board Decision
				additional information and may fail to account for long-term changes that are not due to the Mine.	not required until the next AEMP Re-evaluation Report, the Board encourages De Beers to consider engaging with Parties on this topic to try and reach agreement on options for alternative trend analysis options in advance of completing the AEMP Re-evaluation Report.
5	Model Prediction and Monitoring Data Comparisons	For 2020, water quality in Lake N11 deviated from 2018 EIS predictions during the under-ice period for magnesium, potassium, barium and boron. This was potentially attributed to differences in the model assumptions (for 2018). Modeling was last updated in 2019 for the 2020 amendment; this included data up to 2019 and used 2017-2019 data to calibrate predictions for edge-of-mixing-zone concentrations. None of the comparisons for current-year data for Lake N11 or Area 8 utilized any of the latest model results. Comparing model predictions to monitoring data allows continual evaluation of whether anticipated changes have been appropriately quantified. Comparisons to the EIS are useful to flag potential effects that were not correctly evaluated, and is also useful to compare data to the most recent predictions to assess whether there is an accurate understanding of how water quality will behave and change over time. Comparison of the model predictions between 2018 and 2020 reports do show appreciably higher maximum concentrations predicted in the 2020 EQC	ECCC requests discussion of the monitoring data as compared to the more recent 2020 model results, and whether the model assumptions were more in line with the current results.	At the time of the AEMP data analysis, the updated predictions were not approved; therefore, they were not included in the 2020 AEMP. For Lake N11, when seasonal lake-wide average parameter concentrations in 2020 are compared to the updated water quality modelling predictions for 2020 from the 2020 Water Licence amendment, only ice-cover chloride and zinc concentrations exceeded the predictions for Lake N11. Chloride concentrations from monitoring data were greater than model predictions during ice cover because the model under-predicted chloride concentrations in the water management pond during the discharge period of 2019. Ice-cover zinc concentrations were greater than model predictions due to a single extreme value at station L3. The value was confirmed by the laboratory through re-analysis and the zinc concentration closer to the diffuser (station L1) was notably lower. As only 3 stations were monitored during the ice-cover season in 2020, this one elevated concentration increased the mean/median concentration above the model predictions. It is expected that 2021 concentrations for zinc will be closer to the model predictions. Overall, the updated water quality model	Adequate response.

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		report for Lake 11 and Area 8. Reference: - Section 5.4.2.6 and 5.2.3.6: Comparison to EIS Predictions		predictions and assumptions are more in line with the 2020 AEMP concentrations compared to the 2018 water quality model predictions. Although chloride concentrations were slightly under-predicted, they remain below 75% of the AEMP benchmark and therefore, the elevated concentration has limited ecological relevance. The under-prediction of zinc was anomalous and is not anticipated to be repeated in 2021. Please see the response to GNWT ENR-9 for discussion of differences between Area 8 model predictions and 2020 monitoring data.	
6	Mixing Zone Concentration Comparisons	The 2018 EIS water quality predictions are for the projected maximum concentrations at the edge of the mixing zone (Table 2-7 Effluent Quality Criteria Report, March 19, 2018). In the AEMP report, these are being compared to lake-wide mean/median statistics, which could be lower than edge of mixing zone concentrations for open water (based on Sections 5.4.2.5 and 5.4.3.5 Within-lake Spatial Patterns). Edge-of-mixing zone concentrations are relevant as representing the highest concentration outside the mixing zone, and comparing the lake average to this may understate the actual maximum concentrations at the edge of the mixing zone. ECCC acknowledges that concentrations of all parameters are well below AEMP benchmarks, and that at this time, ecological effects would not be anticipated. However, the method of comparison may be important as concentrations increase to levels	ECCC recommends the Proponent provide a rationale for using lake-wide mean/median data rather than data the stations closest to the mixing zone.	The water quality model predictions assume concentrations in the south basin of Lake N11 are fully mixed. Thus the lake-wide average concentration (mean or median concentration of the five AEMP stations located in the south basin of the lake) is an appropriate metric to compare to the model predictions.	Adequate response.

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		predicted by 2030. Reference: - Section 5.4.2.6 and 5.2.3.6: Comparison to EIS Predictions - Table 2-7 Effluent Quality Criteria Report, March 19, 2018 - Sections 5.4.2.5 and 5.4.3.5 Within-lake Spatial Patterns			

Environmental Protection Operations Directorate
Prairie & Northern Region
5019 52nd Street, 4th Floor
P.O. Box 2310
Yellowknife, NT X1A 2P7

ECCC File: 5100 000 013/007
MVLWB File: MV2005L2-0015

September 10, 2021

via online review system

Shelagh Montgomery
Executive Director
Mackenzie Valley Land and Water Board
7th Floor, 4922 48th Street
P.O. Box 2130
Yellowknife, NT X1A 2P6

Dear Shelagh Montgomery:

RE: MV2005L2-0015– De Beers Canada Inc. – Gahcho Kue – 2020 AEMP Annual Report

Environment and Climate Change Canada (ECCC) has reviewed the information submitted to the Mackenzie Valley Land and Water Board (MVLWB) regarding the above mentioned 2020 AEMP Annual Report. This letter and the attached comments provides ECCC's specialist advice based on our mandate pursuant to the *Canadian Environmental Protection Act* and the pollution prevention provisions of the *Fisheries Act*.

If you need more information, please contact Jennifer Sabourin at Jennifer.Sabourin@ec.gc.ca.

Sincerely,

Jennifer Sabourin
Environmental Assessment Officer

Attachment(s): ECCC Comments Excel Sheet

cc: Jody Small, Acting Head, Environmental Assessment North (NT and NU)

September 10, 2021

Jacqueline Ho
Regulatory Specialist
Mackenzie Valley Land and Water Board
7th Floor – 4922 48th Street
P.O. Box 2130
Yellowknife, NT
X1A 2P6

Dear Ms. Ho,

Re: DeBeers - Gahcho Kue
Water Licence – MV2005L2-0015
2020 AEMP Annual Report Version 1
Request for Comments

The Department of Environment and Natural Resources, Government of the Northwest Territories has reviewed the report at reference based on its mandated responsibilities under the Waters *Act*. ENR comments and recommendations have been submitted to the On-line Review System for the consideration of the Board.

Comments and recommendations were provided by ENR technical experts the Water Management and Monitoring Division and were coordinated and collated by the Environmental Assessment and Monitoring Section (EAM), Environmental Stewardship and Climate Change Division.

Technical questions on this submission can be addressed by:

> Laura Malone: Regulatory and Science Advisor, Water Management and Monitoring Division by email at Laura_Malone@gov.nt.ca or (867) 767-9234 Ext: 53105.

For general questions about this submission, please contact Patrick Clancy, Environmental Regulatory Analyst by email at Patrick Clancy@gov.nt.ca or 867-767-9234 Ext. 53096.

Sincerely,

Patrick Clancy
Environmental Regulatory Analyst
Environmental Assessment and Monitoring Section
Environmental Stewardship and Climate Change Division
Department of Environment and Natural Resources
Government of the Northwest Territories