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November 1, 2023

File: W2020L2-0004

Harry O'Keefe
Arctic Canadian Diamond Company Ltd.
900-606 4 Street SW
Calgary, AB T2P 1T1

Sent by email

Dear Harry,

**Re: Ekati – AEMP – Plankton and Benthos Response Plan – Version 3.1 – Approved with Revisions
Required - Lac de Gras, NT**

The Wek'èezhìi Land and Water Board met on November 1, 2023 and considered the Plankton and Benthos Response Plan Version 3.1,¹ submitted by Arctic Canadian Diamond Mine Ltd.'s (Arctic) on January 25, 2023, as required by Water Licence (Licence) W2020L2-0004.

The Board has not approved the Plankton and Benthos Response Plan Version 3.1, and requires that Arctic revise the Plan as detailed in the Board's Reasons for Decision (attached).

Arctic is to submit Version 3.2 of the Plankton and Benthos Response Plan within 90 days of communication of this decision, addressing the items detailed in the Board's Reasons for Decision. This submission should be prepared in accordance with the Land and Water Boards' *Document Submission Standards*.²

Please direct questions or concerns regarding this letter to Ryan Fequet in writing.

¹ See WLWB Online Registry (www.wlwb.ca) for [Ekati – AEMP – Plankton and Benthos Response Plan – Version 3.1 – Jan 25 23](#)

² See WWB Policies and Guidelines webpage for MVLWB [Document Submission Standards](#).

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Mason Mantla', written in a cursive style.

Mason Mantla
Chair, Wek'èezhì Land and Water Board

BCC'd to: Ekati Distribution List

Attached: Reasons for Decision



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Reasons for Decision

Reference/File Number:	W2020L2-0004 (Type "A" Water Licence)
Licensee:	Arctic Canadian Diamond Company Ltd. (Arctic)
Subject:	Plankton and Benthos Response Plan Version 3.1

Decision from the Wek'èezhìi Land and Water Board Meeting of November 1, 2023

1.0 Decision

On November 1, 2023, the Wek'èezhìi Land and Water Board (WLWB or Board) met and considered the Plankton and Benthos Response Plan,³ submitted by Arctic Canadian Diamond Company Ltd. (Arctic) to the Board on January 25, 2023. After reviewing the Plan and the evidence gathered during the regulatory proceeding, the Board has made the following decisions:

1. To not approve Version 3.1 of the Plankton and Benthos Response Plan;
2. To require Arctic to submit Version 3.2 of the Plankton and Benthos Response Plan within 90 days of communication of this decision, including Revision 1.
3. To require Arctic to select one of the following options:
 - A. In Version 3.2 of the Plan, provide revised Medium and High ALs for phytoplankton density that can be triggered based on density measurements alone; or
 - B. Provide a discussion and proposed revisions to the Response Framework to reflect Arctic's interpretation of phytoplankton total density as a variable in the Response Framework. If Option B is selected, Arctic is to coordinate with Board staff regarding how to align any proposed changes in the Response Framework with the Plankton and Benthos Response Plan.

³ See WLWB Online Registry (www.wlwb.ca) for [Ekati – AEMP – Plankton and Benthos Response Plan – Version 3.1 – Jan 25 23](#).

4. To require Arctic submit additional evidence in Version 3.2 of the Plan to support that Ekati lakes will take three to five years to reverse eutrophication effects, including at minimum, the severity of the eutrophication events in Kodiak Lake and Cujo Lake.

2.0 Background

The Response Framework required by Part J, Condition 7 of the Licence links the results of the AEMP to specific management actions. It requires Arctic to undertake a response should pre-defined levels of environmental change (i.e., action levels) be reached for water quality and biological variables. Action Levels are defined to ensure that environmental change does not reach a “significance threshold,” a level of environmental change that should never occur. If an Action Level is exceeded, Arctic is required to develop a Response Plan for that variable as per Part J, Condition 9(b) of the Licence.

Part J, Condition 9(a) of the Licence requires Arctic to notify the Board of any Action Level exceedance within 60 days of its detection. Version 2.0 of the Plankton and Benthos Response Plan was approved on May 4, 2022, with additional direction for the submission of Version 3.0. Version 3.0 was to be updated to reflect revisions from the Board, and to reflect a new Low Action Level exceedance in 2021 for phytoplankton biomass in Kodiak Lake. Version 3.0 was not approved on October 27, 2022, and additional direction was provided to Arctic for submission of Version 3.1.

Version 3.1 of Arctic’s Plankton and Benthos Response Plan (the Plan) was submitted on January 25, 2023. The Plan was distributed for public review on February 17, 2023, using the Online Review System (ORS). Reviewer comments were due by April 3, 2023, and proponent responses were submitted by the deadline of April 17, 2022. Reviewer comments and recommendations, as well as the proponent responses are available on the WLWB Online Review System.⁴ Comments and/or recommendations were received from the Independent Environmental Monitoring Agency (IEMA), the Government of the Northwest Territories – Department of Environment and Climate Change (GNWT-ECC), and Fisheries and Oceans Canada (DFO). Wek’èezhì Renewable Resources Board (WRRB) and Environment and Climate Change Canada (ECCC) stated they had no comments or recommendations at this time.

3.0 Reasons for Decision

Version 3.1 of the Plankton and Benthos Response Plan (the Plan) was submitted as per Board direction.⁵ Version 2.0 of the Plan was previously approved in part because the Board believed Arctic’s responses with respect to mitigations and continued monitoring to be appropriate, and noted that the Action Levels could be revisited. The Board had also noted that it was useful to have Action Levels in place prior to the open-water season in order to evaluate if low AL exceedance mitigations were working, and to have a point of comparison with previous data.⁶ Version 3.0 of the Plankton and Benthos Response Plan (the Plan) addressed the reported Low AL exceedance for phytoplankton biomass in Kodiak Lake in 2021 and was updated as per Board direction. The Plan has also been updated to include Kodiak Lake for the new

⁴ See WLWB Online Review System for [Ekati – Plankton and Benthos Response Plan V 3.1 – Review Summary](#)

⁵ See WLWB Online Registry for [Ekati – AEMP – Plankton and Benthos Response Plan – V 3.0 – Reasons for Decision – Oct 27 22](#)

⁶ See WLWB Online Registry for [Ekati – AEMP – Plankton and Benthos Response Plan – V 2.0 – Reasons for Decision – May 4 22](#)

phytoplankton biomass Low AL exceedance. The Low AL exceedance had already occurred at other Ekati lakes, so the Plan needed to also consider if any of the previously approved mitigations and monitoring needed to be updated for Kodiak Lake. The Plan did not propose new mitigations or monitoring, and no reviewers had comments on the proposed mitigations and continued monitoring. Version 3.0 of the Plan was not approved.⁷

The Board is of the view that Arctic's responses with respect to mitigations and continued monitoring remain appropriate however during this review it was determined that some of the Action Levels may still not align with the Response Framework. Concerns were raised about the Medium and High Action Levels for phytoplankton density, as discussed in section 3.1. An additional revision was noted to be required as discussed in section 3.1.2, regarding the terminology for phytoplankton biomass and density conditions. Therefore the Board does not approve Version 3.1 of the Plankton and Benthos Response Plan. Version 2.0 of the Plan was previously approved, and will remain in place until the Board can consider Version 3.2.

- ***Decision #1: Not approve Version 3.1 of the Plankton and Benthos Response Plan.***
- ***Decision #2: Arctic to submit Version 3.2 of the Plankton and Benthos Response Plan within 90 days of communication of this decision, including Revision 1.***

3.1 Phytoplankton Density Action Levels

For Version 3.0 of the Plan, the Board required Arctic to clarify if the Medium AL applied to both phytoplankton biomass and density, or just to biomass (i.e., Revision 1 from the May 4, 2022 Reasons for Decision; see Attachment 3 for Action Levels). In section 2.2.1 of Version 3.0 of the Plan, Arctic clarified that the Medium AL applies to both parameters and the M1 and M2 conditions of the Medium AL were edited to include phytoplankton density (see Table 2.2-1 of the Report provided in Attachment 3). The M3 condition remained unchanged and referenced only phytoplankton biomass. In section 2.2.1 of Version 3.0 of the Plan, Arctic also proposed changes to the High AL. In Version 2.0 of the Plan, condition H1 of the High AL required that all three conditions of the Medium AL be met (i.e., conditions M1, M2, and M3). In Version 3.0 of the Plan, Arctic proposed that condition H1 of the High AL require the Medium AL for phytoplankton biomass to be met and did not directly consider phytoplankton density. The H2 condition also remained unchanged and referenced only phytoplankton biomass (via chlorophyll *a* concentrations).

In Version 3.0 of the Plan, Arctic also included Appendix A, which outlined Arctic's position that "setting scientifically defensible Medium ALs and High ALs specific to phytoplankton density is not practicable" but that together, the approved Medium ALs and High ALs for phytoplankton biomass and total density, and community composition, would offer adaptive management tools to prevent reaching Significance Thresholds. A reference to this Appendix was made in a footnote to Table 2.2-1, which outlined the different Action Levels (see Attachment 3). In review of Version 3.0, GNWT-ENR commented on the footnote, and suggested that it was unclear why phytoplankton density was included in Medium and High ALs due to Arctic's position (GNWT-ENR comment 1). GNWT-ENR recommended removing the footnote

⁷ See WLWB Online Registry for [Ekati – AEMP – Plankton and Benthos Response Plan – V 3.0 – Reasons for Decision – Oct 27 22](#)

as it contradicts the Action Levels. Arctic responded that the footnote and Appendix A were included to clarify why the thresholds used in the Medium and High ALs for maximum chlorophyll *a* concentration did not include phytoplankton density, and also noted that GNWT-ENR had not provided evidence to “refute the content and rationale” of Appendix A. Arctic did not think a change to the Plan was required as no contradiction exists. From Arctic’s response, it was the Board’s understanding that the footnote was intended to apply to the Medium and High AL conditions, which relate to chlorophyll *a* concentration thresholds (i.e., that are for biomass). It was unclear to the Board if Arctic believes the Medium and High ALs for phytoplankton density are measurable and defensible using phytoplankton density measurements only.

With respect to Arctic’s footnote that “setting scientifically defensible Medium ALs and High ALs specific to phytoplankton density is not practicable”, GNWT-ENR commented in review of Version 3.0 that it found the M1 and M2 conditions of the Medium AL for the phytoplankton biomass or total density to be scientifically defensible criteria for a Medium AL, and believed a Medium AL for phytoplankton density should be retained using the M1 and M2 criteria (GNWT-ENR comment 2 from review of Version 3.0 of the Plan). Arctic responded that only using the M1 and M2 criteria in practice would mean that if the low AL was exceeded for an increase in total phytoplankton density, then the Medium AL would also be exceeded, in other words, the criteria for the exceedance are the same. Arctic noted that setting a Medium AL that is exceeded under the same conditions as a Low AL is not useful, and did not agree that it was an appropriate AL. The Board agreed that it was unclear how a Medium AL that is exceeded under the same conditions as a Low AL would be useful, but was of the opinion that this situation was in part due to M3 being only related to phytoplankton biomass, and not density.

In Version 3.0, Arctic explained that the Medium AL applies to both biomass and density, but it did not appear to the Board that a Medium AL for phytoplankton density could be triggered using only density conditions. The Board noted that the Medium ALs, and subsequently High ALs for phytoplankton density, could only be exceeded with the triggering of a condition related to biomass. The proposed change to the High AL also involved a situation where the High AL could only be exceeded in relation to biomass condition triggers. Similar to the issue raised in the Reasons for Decision on Version 2.0, it was unclear how the High AL applied to phytoplankton density as the conditions were only related to phytoplankton biomass.

Phytoplankton total density is a biological variable within the approved Response Framework, which notes that Medium and High ALs are developed as part of the Response Plan once a Low AL is exceeded. Because a Low AL for phytoplankton total density has been exceeded, Medium and High ALs for phytoplankton density are to be proposed in this Plan, and once approved, will be considered part of the Response Framework. The Licence requires that submitted Response Plans address “each parameter that has exceeded an Action level” (Schedule 8, Condition 4). Overall, as explained above, it was unclear to the Board how the Action Levels proposed in the Plan apply to phytoplankton density given that the Medium and High AL could not be triggered based on phytoplankton density alone.

Given that it was unclear if there were Medium and High ALs for phytoplankton density based on phytoplankton density measurements, the Board required Arctic to revisit these proposed ALs and provide ALs that reflect phytoplankton density specifically or provide rationale for revising the Response Framework with the upcoming AEMP Re-evaluation to reflect their opinion. The approved Response Framework is based on what was proposed by Arctic, and it was unclear why the Response Framework would include variables for which scientifically defensible ALs could not be developed. If Arctic does not believe the Medium and High AL for phytoplankton density are measurable or scientifically defensible, and the Medium and High AL can not be triggered based on phytoplankton density measurements alone, the Board took the view that the following two options were available to Arctic, and required Arctic to select one of them:⁸

- A. In Version 3.1 of the Plan, provide revised Medium and High ALs for phytoplankton density that can either i) be triggered based on density measurements alone; or ii) more clearly explain how the Medium and High ALs proposed in Version 3.0 align with the approved Response Framework. For either option address the confusion around the scientific defensibility of these ALs; or
- B. Provide a discussion and proposed revisions to the Response Framework to reflect Arctic's interpretation of phytoplankton total density as a variable in the Response Framework, as part of the upcoming AEMP Re-evaluation. If Option 2 is selected, Arctic is to coordinate with Board staff regarding how to align any proposed changes in the Response Framework with the Plankton and Benthos Response Plan.

In Version 3.1 of the Plan, Arctic selected Option A (ii) from the Version 3.0 Reasons for Decision. Arctic reiterated how the relationship of phytoplankton density with nutrient enrichment is not always straightforward and might need supporting information from phytoplankton biomass and/or community composition, to determine “defensible and ecological meaningful Action Levels.” Arctic also provided Appendix A in the Plan with detailed discussion on this position. In the cover letter, Arctic indicated it believed a conservative approach was retaining total phytoplankton density as a Response Framework variable, and that removing it as a variable was not preferred as total phytoplankton density measurements can be useful for early detection and considering changes in plankton communities where no Action Levels for phytoplankton biomass or community composition have been exceeded. Arctic noted that the Low AL and Medium AL for total phytoplankton density can be exceeded before any AL is exceeded for phytoplankton biomass or community composition. Arctic commented that the approved Response Framework allows for integration of different biological metrics within a single Action level already, pointing out that the approved medium and high AL for phytoplankton, zooplankton, and lake benthos community composition all incorporate conditions for changes in edible phytoplankton density, adult crustacean zooplankton density, and dipteran density. Arctic believes this sets a precedence for using a similar approach with the total phytoplankton density action levels. Arctic also highlighted that the approved Response Framework notes that “Medium and high Action Levels may be generic (encompass all biological variables) or based on variable specific considerations” and was of the view that

⁸ See WLWB Online Registry for [Ekati – AEMP – Plankton and Benthos Response Plan – V 3.0 – Reasons for Decision – Oct 27 22](#)

the Action Levels aligned with the Response Framework and Licence. Other Parties did not comment on Arctic's proposed Medium and High ALs for phytoplankton density in review of Version 3.1.

The Board agrees that phytoplankton density and phytoplankton biomass are inter-related, but as discussed above, the AEMP Framework establishes each of these variables as individual response framework variables. The AEMP Framework requires that a low AL be established for each response variable and that medium and high Action Levels for that variable be established through the Response Plan should the low Action Level be triggered. As noted by Arctic, total phytoplankton density measurements can be useful for early detection and for considering changes in plankton communities where no Action Levels for phytoplankton biomass or community composition have been exceeded. As currently proposed in V3.1 of the Response Plan, it remains impossible for a Medium or High AL for phytoplankton density to be triggered based on phytoplankton density alone. Because of the requirement to exceed certain biomass triggers as part of the Medium and High AL (i.e., M3 condition and H2 condition), phytoplankton density could continue increasing without triggering the action levels if they do not also coincide with above threshold increases in biomass. While the Board understands that these two variables are often correlated, these individual response framework variables were proposed by Arctic and selected for a reason, and being able to detect and respond to changes in the individual response framework variables is one of the goals of the Response Framework. The Board agrees that the relationship of phytoplankton density with nutrient enrichment is not always straightforward and do not disagree that supporting information is an important part of explaining potential implications of an Action Level exceedance; however, this can be explored through a Response Plan should a medium Action Level for phytoplankton density be triggered. Arctic gave the example of the approved medium and high AL for community composition variables using integration of different biological metrics as they incorporate density for edible phytoplankton, adult crustacean zooplankton, and dipteran. However, the Board notes that these densities are not individual variables within the Response Framework, like phytoplankton density and phytoplankton biomass are; in this case, they are ways of describing/characterizing community composition. The way that Arctic has proposed the Medium and High ALs for phytoplankton density, they are dependent on phytoplankton biomass also triggering specific threshold conditions. It thus remains unclear how the proposed Medium and High ALs for phytoplankton density align with the Framework. If Arctic is of the view that these should not be individual response framework variables but a combined variable of some sort, this can be addressed through a proposed revision to the Response Framework. Arctic could also consider selecting one of these as the main response framework variable and use the other measure as a supporting explanatory variable.

As Arctic has been unable to demonstrate how the Medium and High ALs as written in Version 3.0 and 3.1 of the Plan align with the Response Framework, the Board has decided that Arctic be required to revise the Medium and High ALs for Phytoplankton density to be able to be solely exceeded through phytoplankton density measurements, or to revise the Response Framework to align with the Medium and High ALs as proposed in Version 3.1.

➤ **Decision #3: Arctic is to either:**

- A. In Version 3.2 of the Plan, provide revised Medium and High ALs for phytoplankton density that can be triggered based on density measurements alone; or**

- B. Provide a discussion and proposed revisions to the Response Framework to reflect Arctic's interpretation of phytoplankton total density as a variable in the Response Framework. If Option B is selected, Arctic is to coordinate with Board staff regarding how to align any proposed changes in the Response Framework with the Plankton and Benthos Response Plan.***

3.1.1 Cyanobacterial blooms

GNWT-ECC commented that in its previous review it had recommended the high AL for phytoplankton density consider an increase in cyanobacterial density in case that cyanotoxin levels become an issue; this could be through identification of a visual algal bloom or a shift in phytoplankton community composition to cyanobacteria dominance (that is more than 80% of the cyanobacteria in the community). Arctic had previously noted that the Ekati AEMP reference lakes can naturally exceed the 80% threshold making it an inappropriate threshold. GNWT-ECC indicated that Arctic's previous reply didn't refute the value of a visual bloom in the high AL (GNWT-ECC comment 2). GNWT-ECC noted that estimates of biomass and density are currently assessed from the average of three open water samples collected during a single sampling event, which is to account for the fact that phytoplankton biomass varies within a lake. GNWT-ECC posited that this creates a potential vulnerability as it may fail to detect localized phytoplankton growth that indicates water quality issues, and that algae and cyanobacterial blooms may be highly localized to the extent that regular sampling may not include a sample within a bloom. GNWT-ECC pointed out that if a bloom was sampled, because of the averaging approach, potential issues may appear less severe. GNWT-ECC recommended that condition H3 of the high AL for phytoplankton density include "or a visual algal bloom or surface scum is detected." (GNWT-ECC comment 2). Arctic responded that a visual assessment would be highly subjective and unreliable, and highlighted that it could be influenced by a number of factors. Arctic noted that not all algal blooms are potentially harmful to aquatic life, and that they are not all the result of anthropogenic activity; Arctic noted planktonic blooms at AEMP lakes have been infrequent, with the most recent one occurring at Count Lake (a reference lake) in August 2020, indicating that conditions that may be considered an algal bloom can occur naturally in AEMP reference lakes. The Board notes that GNWT-ECC hasn't identified previous examples of blooms posing a potential issue for cyanotoxin levels, and as indicated by Arctic, the last bloom occurred in 2020 in a reference lake. The Board agrees that visual identification of algal blooms would be subjective and possibly unreliable, thus incorporating them into the High AL could be problematic. GNWT-ECCC also commented that identifying shifts in phytoplankton community composition towards increased cyanobacterial density could be considered. The Board notes that the Response Framework includes community composition as a response variable and considers changes in the relative abundance of cyanobacteria. While the Board understands it is important to refine action levels when necessary, it is not clear that there is sufficient evidence at this time to add the recommended H3 condition.

3.1.2 Terminology for M3 and H2 of Phytoplankton biomass and density

GNWT-ECC noted that M3 and H2 of the Medium and High ALs for Phytoplankton biomass and/or total density refer to "average open-water season Chlorophyll *a* concentration." (GNWT-ECC comment 3).

GNWT-ECC noted that samples are collected annually and averages are based on a single day's sampling and do not represent open water season averages; therefore, GNWT-ECC recommended the phrase be changed to "the open-water sample event average chlorophyll *a* concentration." Arctic responded that "open-water season" is terminology used throughout the AEMP to distinguish distinct seasonal sampling events (i.e. open-water vs under-ice", and that the proposed text revision would explicitly represent the scope of the data and what is needed for comparison to medium and high ALs. Arctic noted that M3 and H2 could be revised to "the average open-water sample event chlorophyll *a* concentration." The Board believes that Arctic's proposed revision aligns with GNWT-ECC's recommendation and would provide clarity, and therefore directs Arctic to include this revision in Version 3.2 of the Plan.

- ***Revision #1: Arctic to revise the medium and high Action Levels M3 and H2 for Phytoplankton biomass and/or total density to "the average open-water sample event chlorophyll *a* concentration."***

3.2 Trophic Status Recovery Time

In the Reasons for Decision for Version 3.0 of the Response Plan, Arctic was directed to provide the water residence time for Cujo Lake and an estimated range of recovery times for Ekati AEMP Lakes in Version 3.1 of the Plan to reflect remaining questions from IEMA and GNWT-ECC regarding how long it may take a lake to return to its pre-disturbance state.⁹ In Version 3.1, Arctic suggested elevated phytoplankton biomass was reversible within three to five years, but it was challenging to predict due to multiple factors. Arctic based its timing on observations from flushing of the Panda Diversion Channel and discharge of treated sewage effluent to Kodiak Lake between 1997 and 1999, where concentrations returned to pre-disturbance concentrations by 2004; and discharge of elevated nitrate-N and nitrite-N concentrations from the King Pond Settling Facility to Cujo Lake in 2015, where concentrations returned to pre-disturbance concentrations by 2018.

In its review of Version 3.1, GNWT-ECC noted that Arctic had been directed to provide additional information in Version 3.1 to better understand uncertainty regarding duration and reversibility of potential trophic status change following a medium or high AL exceedance. GNWT-ECC commented that it found the evidence provided in Version 3.1 of the Plan was inadequate for a reasonable review, noting it didn't include the severity of the eutrophication events in Kodiak Lake or Cujo Lake, and that for both cases, the recovery described was from nutrient enrichment. GNWT-ECC cannot support Arctic's statement that three to five years would be sufficient time to reverse effects of eutrophication (GNWT-ECC comment 4). GNWT-ECC noted that the discussion didn't adequately discuss potential risks of under-ice internal loading if productivity increased further, but that there was a detailed discussion of internal loading in the Total Phosphorus Response Plan; Arctic's discussion in the Total Phosphorus Response Plan Version 2.1 indicated the amount of nutrients available for internal loading from lake sediments had not been affected by mine-related activities, and that it was likely oxygen would still be present in surface sediments so risk of phosphorus release due to low-oxygen conditions is low. The Plankton and Benthos

⁹ See WLWB Online Registry for [Ekati – AEMP – Plankton and Benthos Response Plan – V 3.0 – Reasons for Decision – Oct 27 22](#)

Response Plan notes in section 2.2.1 that internal loading is not a major concern for Ekati AEMP lakes. From GNWT-ECC's context regarding internal loading and the Total Phosphorus Response Plan, it is unclear to the Board what concerns remain regarding internal loading.

GNWT-ECC (comment 4) provided examples of Meretta and Niven Lakes as examples of Canadian Arctic lakes that had significant cultural eutrophication and recovery, and could be used as further evidence in a more comprehensive discussion of recovery times. Arctic commented that the examples of Meretta and Niven Lakes provided by GNWT-ECC were not appropriate for comparison to AEMP lakes for a number of reasons, including that Niven Lake was a sewage lagoon for over 30 years, and that Meretta Lake has received raw sewage since the 1950s, which has a phosphorus load that is a magnitude greater than the maximum load from the King Pond Settling Facility to Cujo Lake.

GNWT-ECC recommended Arctic provide a revised response to WLWB Directive 2, Revision 1 from the Reasons for Decision on Version 3.0 of the Plan (GNWT-ECC comment 4).¹⁰ Arctic responded that it believed the information provided was adequate and addressed Revision 1, which was for Arctic "to provide the water residence time for Cujo Lake and estimated range of recovery times for Ekati AEMP lakes in Version 3.1 of the Plan." It appears to the Board that GNWT-ECC's recommendation is related to the evidence provided by Arctic to support its suggestion that 3-5 year time frame would be an appropriate estimate for a trophic shift reversal in lakes at the Ekati site.

The Board notes that as per Arctic's response, it included the water residence time and estimated range of recovery times as previously directed by the Board in Version 3.1 of the Plan. However, the Board is of the opinion that there does appear to be uncertainty with respect to the evidence as to why a three-to-five-year time frame is appropriate for reversing effects of eutrophication in Ekati site lakes, and the review of Version 3.1 of the Plan was the first opportunity for Parties to consider this time frame. To address GNWT-ECC's concerns, the Board directs Arctic to provide additional evidence to support the expected three-to-five years as sufficient time to reverse eutrophication effects, including at minimum, the severity of the eutrophication events in Kodiak Lake and Cujo Lake. This information is important with respect to determining the appropriateness of the Medium and High ALs for plankton and benthos variables, as part of determining if a Medium or High AL exceedance has occurred depends on a sustained trophic level change.

- ***Decision #4: Arctic is to submit additional evidence in Version 3.2 of the Plan to support that Ekati lakes will take three to five years to reverse eutrophication effects, including at minimum, the severity of the eutrophication events in Kodiak Lake and Cujo Lake.***

¹⁰ See WLWB Online Registry for [Ekati – AEMP – Plankton and Benthos Response Plan – V 3.0 – Reasons for Decision – Oct 27 22](#)

3.3 Other Comments

3.3.1 *Study of Drivers of Benthic Community Composition*

In its review, IEMA noted that Section 3.2 of the Plan summarizes an assessment of benthic community changes in the 2015 AEMP Re-evaluation, which reiterates a special study (i.e., Study of Drivers of Benthic Community Composition) that concludes no mine-related causes of change in benthic invertebrate communities exists in AEMP lakes (IEMA comment 1). The study highlighted the importance of sediment silt content as a driver of community composition, and suggested that temporal and spatial trends in the data were weak, and it was unlikely overall changes in benthic community metrics were due to mine-related effects. IEMA identified that if an exceedance of a benthos metric's low AL is determined to be unrelated to the mine, then the metric is no longer considered to have exceeded the low AL. IEMA highlighted that the study was last completed in 2015, and does not include data from the last two sediment sampling years, and recommended the study be reinitiated and updated to include current data. IEMA posited that Version 3.1 of the Plan uses the 2015 sediment assessment to conclude benthos metrics measured in the AEMP since 2015 have not exceeded the low AL. Arctic responded that the evaluation of effects for benthic community composition is completed by comparing community composition in monitored lake to baseline composition and/or trends of the reference lakes, and noted that the conclusions made for benthic community composition in the 2020, 2021, and 2022 AEMPs were based on similar trends in reference lakes rather than the conclusions of the referenced study. Arctic highlighted that no AL exceedances occurred in 2022, and conclusions of no mine-related effects for benthic community composition in the AEMP have been based on the comparison to baseline conditions and/or reference lake trends. Arctic therefore reasoned that proposed updates would not provide additional environmental protection, and are not needed at this time. The Board is of the opinion that Arctic's rationale is reasonable given that the study has not been used in the last three years for determining conclusions, and as identified by Arctic, no Action level exceedances have been observed for community metrics. As such, no further direction is needed at this time.

3.3.2 *Drivers in changes in plankton community metrics*

Section 2.3.2 of the Plan identified the likely cause(s) of action level exceedances for phytoplankton and zooplankton community composition. This section discusses results from the 2012 AEMP Re-evaluation Report, which presented the results of multivariate statistical analyses; this analysis was used to look at relationships between biological variables (like plankton community composition) and environmental variables (such as water quality). The results found that there was some relation with changes in relative density of phytoplankton and zooplankton communities connected to conductivity, pH, water hardness, and some metals, but that a review of species sensitivity data suggested the concentrations of water quality variables were well within tolerance ranges of taxa found at Ekati. In this section, Arctic hypothesized that shifts in community composition were more likely related to changes in macronutrient ratios and/or concentrations. IEMA commented that while it "has no reason to suggest this conclusion is not accurate", it believed the variables for conductivity, pH, water hardness, and some metals should be discussed in terms of if there could be additive or synergistic toxicity effects that could be responsible for changes in plankton community metrics (IEMA comment 2). Arctic responded that the evidence compiled

and documented through multiple investigations and analyses in the last four AEMP Re-evaluations indicated changes were related to macronutrients. Arctic highlighted that while phytoplankton community composition did not reflect baseline conditions, there had been no effect on edible phytoplankton as related to the significance threshold (i.e., lack of available food for fish), and that concentrations of water quality variables had peaked and were predicted to decrease downstream of the Long Lake Containment Facility (LLCF). For these reasons, Arctic noted the proposed analysis wouldn't provide additional environmental protection and was not necessary. The Board agrees with Arctic's rationale, and it is unclear what additional value this recommended analysis would provide at this time; as such, no further direction is needed at this time.

3.3.3 Population metrics in relation to fish diet

DFO commented that a shift in the diets of fish species had been detected in Cujo and Leslie Lakes, which was attributed by Arctic to a change in food webs in the two lakes (DFO comment 1). Arctic had reported that this shift was only observed in Round Whitefish and had not found negative effects on individual or population health, and Slimy Sculpin sampling had not indicated any consistent pattern in changes to diet. DFO recommended the population metrics and diets of Round Whitefish and Slimy Sculpin in Cujo and Leslie Lakes continue to be monitored. Arctic responded that these metrics would continue to be monitored as described in the AEMP Design Plan which includes population dynamics (catch per unit effort) and diets. As this recommendation is already captured within the AEMP Design Plan, further direction is not required.

Signed the 1st day of November 2023, on behalf of the Wek'èezhìi Land and Water Board



Mason Mantla
Chair, Wek'èezhìi Land and Water Board



Witness