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September 5, 2024

File: W2015L2-0001

Mark Nelson and Nicole Goodman
Diavik Diamond Mines (2012) Inc.
P.O. Box 2498, 300-5201, 50th Avenue
Yellowknife, NT X1A 2P8

Sent by email

Dear Mark Nelson and Nicole Goodman,

Re: 2020 to 2022 Aquatic Effects Re-evaluation Report, Version 1 – Approved with Revisions Required – Diavik Diamond Mines (2012) Inc. – Mining and Milling – Lac de Gras, NT

The Wek'èezhì Land and Water Board (Board) met on August 28, 2024 and considered the 2020 to 2022 Aquatic Effects Re-evaluation Report, Version 1,¹ submitted by Diavik Diamond Mines (2012) Inc. (DDMI) as required by Water Licence (Licence) W2015L2-0001.²

The Board has determined that the 2020 to 2022 Aquatic Effects Re-evaluation Report, Version 1 meets the requirements of Part I, Condition 9 and Schedule 7, Condition 5 of the Licence and relevant previous Board directions.³ The Board has decided to approve Version 1 of the 2020 to 2022 Aquatic Effects Re-evaluation Report and requires submission of Version 1.1 to the Board within 60 days of the Board decision being issued. Version 1.1 is to address revisions detailed in the attached Reasons for Decision.

¹ See WLWB Online Registry (www.wlwb.ca/) for [Diavik - AEMP - 2020 to 2022 Aquatic Effects Re-evaluation Report - Part 1 of 3 - May 8 24](#), [Diavik - AEMP - 2020 to 2022 Aquatic Effects Re-evaluation Report - Part 2 of 3 - May 8 24](#), and [Diavik - AEMP - 2020 to 2022 Aquatic Effects Re-evaluation Report - Part 3 of 3 - May 8 24](#).

² See WLWB Online Registry for [Diavik - WL Amendment - Decommissioning - Issuance Letter and Licence - Apr 17 24](#).

³ See WLWB Online Registry for [Diavik - AEMP - 2014 to 2016 Re-eval Report and Design Plan V5 - Reasons for Decision - Mar 25 19](#); [Diavik - 2017-2019 Re-evaluation and QAPP - Reasons for Decision - Jan 31 22](#); [Diavik - AEMP Aquatic Effects Re-eval Addendum and Design Plan V6.0 - Reasons for Decision - Sep 2 22](#); [Diavik - AEMP Annual Report - 2021 - Reasons for Decision - Oct 19 22](#); [Diavik - Reference Conditions Report - Version 2.0 - Reasons for Decision - Oct 19 22](#); and [Diavik - AEMP Design Plan - Version 6.1 - Reasons for Decision - Apr 27 23](#).

The Board has also provided directions for an updated Aquatic Effects Monitoring Program (AEMP) Design Plan as described in the Reasons for Decision.

Version 1.1 of the 2020 to 2022 Aquatic Effects Re-evaluation Report and the updated AEMP Design Plan should be prepared in accordance with the Land and Water Board (LWB) *Document Submission Standards*.⁴ Version 1.1 of 2020 to 2022 Aquatic Effects Re-evaluation Report and the updated AEMP Design Plan will each be considered approved when DDMI receives written confirmation of conformity.

Please direct questions or concerns regarding this letter to Ryan Fequet via [email](#).

Yours sincerely,



Mason Mantla
Chair, Wek'èezhìi Land and Water Board

BCC'd to: Diavik Distribution List
Joe Heron – Inspector, GNWT-ECC

Attached: Reasons for Decision

⁴ See WLWB Policies and Guidelines webpage for LWB [Document Submission Standards](#).



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Reasons for Decision

Reference/File Number:	W2015L2-0001 (Type "A" Water Licence)
Licensee:	Diavik Diamond Mines (2012) Inc. (DDMI)
Subject:	2020 to 2022 Aquatic Effects Re-evaluation Report, Version 1

Decision from the Wek'èezhì Land and Water Board Meeting of August 28, 2024

1.0 Decision

On August 28, 2024, the Wek'èezhì Land and Water Board (WLWB or the Board) considered Diavik Diamond Mines (2012) Inc.'s 2020 to 2022 Aquatic Effects Re-evaluation Report, Version 1.⁵ In consideration of the submission, reviewer comments, and proponent responses, the Board has decided the following:

1. To approve the 2020 to 2022 Aquatic Effects Re-evaluation Report;
2. To require Version 1.1 of the 2020 to 2022 Aquatic Effects Re-evaluation Report to include Revisions #1 to #10 summarized in Appendix A, and to be submitted for conformity by Board staff within 60 days of the Board issuing its decision;
3. To require an updated AEMP Design Plan to include Revisions #1 to #8 summarized in Appendix B, and to be submitted for conformity by Board staff within 60 days of the Board issuing its decision;
4. To require DDMI to complete the snow chemistry assessment without averaging duplicate samples in future assessments and reports;

⁵ See WLWB (www.wlwb.ca) Online Registry for [Diavik - AEMP - 2020 to 2022 Aquatic Effects Re-evaluation Report - Part 1 of 3 - May 8 24](#), [Diavik - AEMP - 2020 to 2022 Aquatic Effects Re-evaluation Report - Part 2 of 3 - May 8 24](#), and [Diavik - AEMP - 2020 to 2022 Aquatic Effects Re-evaluation Report - Part 3 of 3 - May 8 24](#).

5. To require DDMI to include a statement clarifying that quality control samples will only be used to validate data quality and not be included in any data analysis in the AEMP Design Plan and/or the Quality Assurance Project Plan, as appropriate for Board staff conformity;
6. Not to approve the discontinuation of the snow chemistry monitoring at this time but acknowledges this monitoring can be reconsidered once the dust component of the FCRP and closure criteria for dust deposition are approved;
7. To approve the proposed change to the spatial analysis of effects and Action Level assessment of major ions to only include the dissolved form;
8. Not to approve dropping phytoplankton richness from the Action Level evaluation at this time;
9. Not to approve the adjustment of the normal range for phytoplankton richness at this time;
10. Not to approve the adjustment to the normal ranges for total and relative diatom and microflagellate biomass at this time;
11. To require DDMI to apply the revised approach for phytoplankton community assessment using three ordinations based on the proposed date divisions of 2002 to 2012, 2013 to 2019, and 2020 onward in the next Aquatic Effects Re-evaluation Report;
12. Not to approve the modification of the 5% density threshold for benthic invertebrate taxa after the exclusion of anomalous values and directs DDMI to maintain the use of the 5% threshold as detailed in Version 6.1 of the AEMP Design Plan;
13. To require DDMI to provide the 2022 TK follow-up study Lake Trout tissue chemistry raw data in unsecured Excel format per the LWB *Document Submission Standards* within 60 days of this Board decision to be added to the WLWB online public registry; and
14. To require DDMI to confirm that similarity in patterns and relationships between total nitrogen and total Kjeldahl nitrogen concentrations remains consistent in the 2023 to 2025 Aquatic Effects Re-evaluation Report.

2.0 Background

The Aquatic Effects Monitoring Program (AEMP) represents an extensive monitoring program, which includes the monitoring of water, sediment, and several types of living organisms around the Diavik site. The purpose of the AEMP is to measure and evaluate potential effects of the mine on the Receiving Environment. The AEMP Design Plan outlines the details for the sampling program (e.g., sampling locations, field and laboratory methods, and data analysis methods) and the AEMP Annual Report presents the results from the previous year of monitoring.

Under Part I, Condition 9 of Water Licence W2015L2-0001 (the Licence), DDMI is required to submit an Aquatic Effects Re-evaluation Report every three years, or as directed by the Board.⁶ The Aquatic Effects Re-evaluation Report is meant to evaluate the overall effectiveness of the AEMP by providing a comprehensive interpretation and discussion of the data collected since Project inception with the following goals: describing the Project-related effects on the Receiving Environment; updating predictions

⁶ See WLWB Online Registry for [Diavik - WL Amendment - Decommissioning - Issuance Letter and Licence - Apr 17 24.pdf](#).

of Project-related effects on the Receiving Environment; and providing supporting evidence for proposed revisions to the AEMP Design Plan.

The 2020 to 2022 Aquatic Effects Re-evaluation Report was submitted to the Board on January 2, 2024. Following conformity correspondence with Board staff, an updated version was received on May 8, 2024. The cover letter of the submission included the following statement:

[T]he recommendations referenced throughout the 2020-2022 AEMP Re-evaluation Report are specific to an update to the Operational AEMP Design Plan and requests that they be considered by the Board for approval through this 2020-2022 AEMP Re-evaluation Report review process. Recommendations to the next Operational AEMP Design Plan update are summarized in Section 16 of the report.

Thus, while closure of the Diavik Diamond Mine is planned for 2026, the scope of the review of the 2020 to 2022 Aquatic Effects Re-evaluation Report was intended to apply and consider the operational phase of the Project. As detailed in the Board's Reasons for Decision on the Decommissioning Amendment, there are updates expected for the AEMP Design Plan that will consider the transition to closure and the closure/post-closure phases.⁷

The Report was distributed for public review on May 16, 2024 and review comments were due by July 2, 2024. Comments were received from the Environmental Monitoring Advisory Board (EMAB) and the Government of Northwest Territories – Environment and Climate Change⁸ (GNWT-ECC). Board staff also submitted questions on the submissions. Proponent responses were submitted by the deadline of July 16, 2024. Reviewer comments and recommendations, as well as Proponent responses, are available on the WLWB Online Review System (ORS).⁹

3.0 Reasons for Decision

The 2020 to 2022 Aquatic Effects Re-evaluation Report was reviewed for conformity to Part I, Condition 9 and Schedule 7, Condition 5 of the Licence and to previous Board direction from the following documents:

- 2014 to 2016 Aquatic Effects Re-evaluation Report and AEMP Design Plan, Version 5.0;¹⁰
- 2017 to 2019 Aquatic Effects Re-evaluation Report and Version 4.0 of the Quality Assurance Project Plan;¹¹

⁷ See WLWB Online Registry for [Diavik - WL Amendment - Decommissioning - RFD and Recommendation to the Minister - Mar 19 24](#).

⁸ Wording on the Online Review System (ORS) refers to the Government of the Northwest Territories – Environment and Natural Resources – Environmental Assessment and Monitoring (GNWT-ENR-EAM). However, the GNWT Departments of Lands, and Department of Environment and Natural Resources were amalgamated into the Department of Environment and Climate Change (GNWT-ECC) on April 1, 2023.

⁹ See ORS for [Diavik - 2020 - 2022 Aquatic Effects Re-evaluation Report](#).

¹⁰ See WLWB Online Registry for [Diavik - AEMP - 2014 to 2016 Re-eval Report and Design Plan V5 - Reasons for Decision - Mar 25 19](#).

¹¹ See WLWB Online Registry for [Diavik - 2017-2019 Re-evaluation and QAPP - Reasons for Decision - Jan 31 22](#)

- 2017 to 2019 Aquatic Effects Re-evaluation Report Addendum and AEMP Design Plan, Version 6.0;¹²
- 2021 AEMP Annual Report;¹³
- Reference Conditions Report, Version 2.0;¹⁴ and
- AEMP Design Plan, Version 6.1.¹⁵

All reviewer comments and proponent responses submitted during the public review period were also reviewed. No significant concerns were raised during this review, and the Board suggest DDMI responded appropriately and completely to all comments.

Based on the review, the Board has decided to approve the 2020 to 2022 Aquatic Effects Re-evaluation Report Version 1.0 and require submission of Version 1.1 of the 2020 to 2022 Re-evaluation Report for Board staff conformity within 60 days of the Board issuing its decision. The reasons for this decision are as follows:

- The Report satisfies the relevant terms and conditions set out by the Licence;
- The responses from DDMI provided adequate clarifications to comments from reviewers; and
- The issues raised through the public review of this Report have been addressed through proponent responses or can be addressed in future submissions related to the AEMP as discussed in more details in these Reasons for Decision below.

It is important to have accurate information on the public registry to avoid potential confusion in future reporting and reviews. Parties need to be aware that errors were identified and be provided with correct information, but there also needs to be a balance that considers potential time and cost implications as to how best to address these errors (e.g., requirement of an updated version of the report or an alternative approach). In this case, the Board is of the opinion that the nature of the updates are best addressed through an updated version of the 2020 to 2022 Aquatic Effects Re-evaluation Report to avoid potential confusion if people access this information in future.

- ***Decision #1: The Board has approved the 2020 to 2022 Aquatic Effects Re-evaluation Report.***
- ***Decision #2: The Board requires Version 1.1 of the 2020 to 2022 Aquatic Effects Re-evaluation Report to include Revisions #1 to #10 summarized in Appendix A, and to be submitted for conformity by Board staff within 60 days of the Board issuing its decision.***

¹² See WLWB Online Registry for [Diavik - AEMP Aquatic Effects Re-eval Addendum and Design Plan V6.0 - Reasons for Decision - Sep 2 22](#).

¹³ See WLWB Online Registry for [Diavik - AEMP Annual Report - 2021 - Reasons for Decision - Oct 19 22](#).

¹⁴ See WLWB Online Registry for [Diavik - Reference Conditions Report - Version 2.0 - Reasons for Decision - Oct 19 22](#).

¹⁵ See WLWB Online Registry for [Diavik - AEMP Design Plan - Version 6.1 - Reasons for Decision - Apr 27 23](#).

As discussed in these Reasons for Decision, the Board also requires an updated AEMP Design Plan for Board staff conformity within 60 days of the Board issuing its decision. The revisions for the 2020 to 2022 Re-evaluation Report and the AEMP Design Plan are synthesized in Appendix A and B respectively.

- ***Decision #3: The Board requires an updated AEMP Design Plan to include Revisions #1 to #8 summarized in Appendix B, and to be submitted for conformity by Board staff within 60 days of the Board issuing its decision.***

3.1 General Comments and Minor Errors

During the review of the comments and responses, it was identified that DDMI's responses to the following comments either adequately addressed or provided additional information that resolved the concern(s) raised by a Party or clarified the concern to be invalid: WLWB staff comments 1, 2, 5 to 7, 11, and 17; EMAB comments 4, 8, 9, 11, 13, 14, 16, 18, 19, 20, 31, and 32; and GNWT-ECC comments 4 and 8. The Board considers these comments to be resolved and no further actions are required at this time.

A number of minor errors were identified by reviewers and were confirmed as errors by DDMI; these are summarized as Revision #1, items (a) to (g) in Appendix A of these Reasons for Decision. The Board acknowledge these errors are relatively minor; however, there remains a potential risk of confusion should Parties consider the 2020 to 2022 Aquatic Effects Re-evaluation Report without awareness of the identified errors. Given other changes are required to be completed in an updated 2020 to 2022 Aquatic Effects Re-evaluation Report (i.e., Version 1.1), the Board requires DDMI to also correct these minor errors; these corrections are to be for confirmation of conformity by Board staff. This will allow an updated corrected version of the report to be made available on the online registry.

- ***2020 to 2022 Aquatic Effects Re-evaluation Report Revision #1: The Board requires DDMI to correct the minor errors identified as Revision 1, items (a) to (g) in Appendix A in Version 1.1 of the Aquatic Effects Re-evaluation Report for confirmation of conformity by Board staff.***

3.2 Dust Depositional Monitoring

3.2.1 Missing Information and Errors

The Diavik AEMP includes a dust monitoring component because dust generated from mining activities may be deposited around the Mine and into Lac de Gras. The dust component of the AEMP Annual Report aims to determine dust deposition rates with distance from the Diavik Mine and the chemical characteristics of dustfall by analyzing snow water. Analyses of potential effects of dust on water quality are also conducted as part of the Aquatic Effects Re-evaluation Report.

During the public review, EMAB (comments 1 and 2) identified two instances of what appeared to be missing information, which DDMI confirmed were omissions and provided the following additional information in response:

- The geometric mean for station FFA-4 is missing from Figure 3-2 because the reported dust deposition rate value for 2022 was 0 mg/dm²/yr. This value was considered an outlier due to potential sampling bias and was removed from the dataset. Station FFA-4 was only sampled in 2019 and 2022; therefore, removing this suspect data point prevents the geometric mean from being calculated for that station.
- No information was included to explain why dust deposition rates may have increased in recent years. DDMI noted that a combination of locally generated and long-range transport may have contributed to increased deposition rate of total phosphorus. DDMI provided a list of potential sources (e.g., soil and desert dust, marine aerosols, pollen, volcanic ash, biomass burning, fossil fuel combustion, and phosphate manufacturing) and noted that increased wildfire events may also have contributed to this increase.

DDMI has acknowledged the omissions, provided sufficient information to address the comments, and indicated an update to the 2020 to 2022 Aquatic Effects Re-evaluation Report could be completed if required by the WLWB. The Board notes that it is important to have accurate information on the public record and requires DDMI to include these revisions in Version 1.1 of the 2020 to 2022 Aquatic Effects Re-evaluation Report; these revisions are included in Appendix A. The Board considers these revisions for Board staff conformity.

- ***2020 to 2022 Aquatic Effects Re-evaluation Report Revision #2: The Board requires DDMI to include an explanation of why a geometric mean for dust deposition at station FFA-4 is not included for the 2019 to 2022 period in Version 1.1 of the Aquatic Effects Re-evaluation Report for Board staff conformity.***
- ***2020 to 2022 Aquatic Effects Re-evaluation Report Revision #3: The Board requires DDMI to include an explanation of why dust deposition rates may have increased in recent years in Version 1.1 of the Aquatic Effects Re-evaluation Report for Board staff conformity.***

During the public review, it was noted that duplicate snow chemistry samples were averaged to obtain a representative value for each station (WLWB staff comment 3). Duplicate samples that are collected for QA/QC purposes are used to assess variability between samples collected at the same time and location and assess the precision of field sampling methods and laboratory analyses. These duplicate samples typically are not included in subsequent data analysis. The Board acknowledges that in instances where the relative percent difference is small, this averaging approach likely would have little impact on the data, but in instances where the intra-station variability is high (i.e., relative percent difference equal to or greater than 60%), the averaging could modify the data in a manner that potentially results in masking important differences or trends in the snow chemistry data. In addition, Board staff noted this approach of averaging duplicate samples is not included in the AEMP Design Plan Version 6.1. In response, DDMI confirmed that averaging of duplicate samples has been applied in dust sections of all previous re-evaluation reports and annual reports. DDMI noted that the averaging method will not affect the reported

spatial trends but would consider using one of the duplicate samples in future analyses (i.e., not averaging duplicate samples) for consistency with the water and sediment quality components if directed to do so by the WLWB. The Board requires DDMI to stop applying the approach of averaging duplicate samples in future assessments and reports but is of the view that no changes to the current report or AEMP Design Plan are necessary. To avoid potential confusion and errors in future assessments, the Board requires DDMI to include a statement that clarifies quality control samples will only be used to validate data quality and not be included in any data analysis in the AEMP Design Plan and/or the Quality Assurance Project Plan. The Board allows DDMI to determine if updates to one or both documents is necessary. The Board requires this update to be for conformity by Board staff.

- ***Decision #4: The Board requires DDMI to complete the snow chemistry assessment without averaging duplicate samples in future assessments and reports.***
- ***Decision #5: The Board requires DDMI to include a statement clarifying that quality control samples will only be used to validate data quality and not be included in any data analysis in the AEMP Design Plan and/or the Quality Assurance Project Plan, as appropriate for Board staff conformity.***

3.2.2 Design Plan Changes

DDMI has proposed to cease monitoring snow chemistry because analyses to date have shown negligible effects on Lac de Gras and in some cases, effects may not be able to be detected because of the confounding presence of effluent or other dust sources. DDMI has also indicated that no other component uses the snow chemistry results. EMAB noted that total phosphorus snow chemistry results were referred to under the plankton component (EMAB comment 23). The Board notes that the text referred to by EMAB was very general but was still able to qualify that the observed increase in chlorophyll *a* in 2021 appeared to be unrelated to effluent or dust inputs because there had been no obvious changes. The Board further notes that closure criteria are still in development in the Final Closure and Reclamation Plan (FCRP) and that the FCRP currently includes the continuation of snow chemistry monitoring. The Board requires DDMI to retain snow chemistry monitoring under the AEMP until the dust component of the FCRP and final closure criteria are approved as a precautionary approach to avoid potential issues with missing data should it be determined that this component is required through closure and post-closure.

- ***Decision #6: The Board has decided not to approve the discontinuation of the snow chemistry monitoring at this time but acknowledges this monitoring can be reconsidered once the dust component of the FCRP and closure criteria for dust deposition are approved.***

3.3 Sediment Quality

Sediment quality monitoring is a component of the AEMP, which is designed to assess effects of treated effluent and other potential mine-related activities (e.g., historical dike construction). Sediment chemistry provides information regarding chemical stressors present in the sediments and may help explain the

effects observed in the biological endpoints, particularly benthic invertebrates. Currently, DDMI monitors sediments in Lac de Gras every three years in conjunction with the comprehensive biological monitoring program. Monitoring parameters include particle size, concentrations of nutrients and metals, and total organic carbon, which aids in assessing occurrence and potential bioavailability of metals in sediment and is an indicator of food availability to benthic invertebrates.

3.3.1 Total Organic Carbon

EMAB (comments 5 and 6) requested clarification regarding what sampling depth for total organic carbon was presented in the Report because DDMI has acknowledged sampling methods have varied over the years. EMAB also questioned if results would vary between the 1 cm and 5 cm sampling depths and requested that both results be provided. In response, DDMI confirmed all results presented for total organic carbon were based on the 1 cm sampling depth. DDMI again acknowledged that sampling methods had varied over time but noted that the total organic carbon data from both sampling depths were within the same range (with the exception of three samples collected in 2022) and that there was no additional information in the 5 cm depth data that would change the overall interpretation. Based on this information, the Board acknowledges DDMI's position and given inherent spatial variability that is known to occur in sediment concentrations as well as how total organic carbon is incorporated into the sediment quality assessment essentially as a supporting variable, the Board does not require additional analysis of the 5 cm depth total organic carbon data at this time.

EMAB (comment 7) noted that total organic carbon concentrations have increased in the near-field area, with the highest concentrations occurring in 2022. DDMI acknowledged this increase but noted that the results for 2022 were not significant, that the statistical results vary, and inconsistent increases were observed outside of the near-field area. DDMI's response further noted that "even though the increases in sediment TOC observed in the NF area could be Mine-related, the lack of responses from other indicators (e.g., biomass indicators) does not support this observation." EMAB (comment 7) recommended completing the trend analysis on untransformed data without normalizing the data using total organic carbon, which DDMI did not agree with because the purpose of including the normalizing factor is to reduce the influence of confounding factors on the results. The Board agrees with DDMI and does not require additional analyses of parameters using untransformed data at this time.

3.3.2 Uranium Sediment Guideline

In 2022, strontium and uranium triggered Action Level 1, which is considered an early warning and no response action is required, while bismuth and molybdenum triggered Action Level 2. The response action for Action Level 2 is to develop an effects benchmark if one does not already exist and this is completed through a response plan.

Bismuth had previously triggered an Action Level 2 exceedance in 2019. The development of an effects benchmark was attempted but was unsuccessful because there were no studies available in the literature providing evidence of aquatic toxicity of bismuth. This was discussed in the approved AEMP Design Plan

Version 6.1.¹⁶ Following the 2022 Action Level 2 exceedance for molybdenum in sediment, an effects benchmark for molybdenum was proposed and approved through an AEMP Response Plan.¹⁷

GNWT-ECC (comment 3) noted that in developing the molybdenum effects benchmark, DDMI adopted the British Columbia Ministry of the Environment (BCMOE) lower working sediment quality guideline for molybdenum of 25 mg/kg. In review of DDMI's assessment of uranium concentrations in sediment in the Re-evaluation Report, GNWT-ECC noted that DDMI assessed sediment concentrations of uranium against literature values but questioned why DDMI has not proposed to adopt the no effects level of 100 mg/kg dry weight for future screening. In response, DDMI stated "[t]he adoption of the quoted uranium no-effect level of 100 mg/kg dw was not considered due to lack of sufficient supporting literature for the adoption of this concentration as a benchmark for the AEMP. Thus, the decision was made to use it as a reference value, but not as a benchmark."

The Board notes that although uranium concentrations have been elevated in sediment in most monitoring years, this parameter has not triggered an Action Level 2; therefore, the response action of establishing an effects benchmark is not yet required. The use of the 100 mg/kg dw as a reference value is considered appropriate at this time and should an Action Level 2 be triggered for uranium, then DDMI will be required to establish an appropriate benchmark. As such, the Board considers no further action on this item to be required at this time.

3.3.3 Design Plan Changes

Currently, AEMP Design Plan Version 6.1 requires analysis of total nitrogen in sediment with and without 2013 data because these data are atypically high compared to results from other years. DDMI has recommended that the 2013 total nitrogen data should be excluded from future trend analysis. DDMI has determined that different results were achieved for the normalizing variable (i.e., total organic carbon was used when 2013 data were included and percent fines was used when 2013 data were excluded), which invalidates the comparison between the two trend analyses. DDMI also noted that including the 2013 sediment data "created an artificial peak followed by a reduction which was not supported by other results for sediment, water, or effluent quality." DDMI has recommended that the 2013 total nitrogen data should be excluded from trend analysis due to the atypical nature of the results, which has been corroborated by the data obtained since 2016. During the public review, it was noted that the text as written was not clear if DDMI was requesting the removal of the 2013 sediment data as a design plan change and asked for clarification, which DDMI confirmed was the case (WLWB staff comment 14).

GNWT-ECC (comment 4) did not agree with DDMI's proposed removal of the 2013 total nitrogen parameter from future trend analyses. GNWT-ECC noted that increased concentrations were again observed in 2022 and for that reason, DDMI should be required to retain the 2013 total nitrogen data unless an explanation for the cause(s) of the elevated concentrations can be provided. In response, DDMI

¹⁶ See WLWB online registry for [Diavik - AEMP Design Plan - Version 6.1 - Dec 27 22.pdf](#).

¹⁷ See WLWB online registry for [Diavik - AEMP - Molybdenum in Sediment Response Plan - Decision Letter - May 18 23.pdf](#).

noted that the 2013 data are considered anomalous, which was corroborated by the results of each subsequent comprehensive year AEMP. DDMI also noted that the WLWB approved removal of the 2013 total nitrogen data from future aquatic effects re-evaluation reports in the January 31, 2022, Reasons for Decision on 2017 to 2019 Aquatic Effects Re-evaluation Report and Version 4.0 of the Quality Assurance Project Plan.¹⁸

The Board acknowledges that DDMI is correct in that the Board approved the removal of the 2013 total nitrogen data from the trend analysis as outlined in the response to GNWT-ECC comment 4. As such, no further decision regarding approval of removing these data is required but the Board requires DDMI to include an explanation that the 2013 total nitrogen data is excluded from all trend analysis for the sediment component in an updated version of the AEMP Design Plan for Board staff conformity; this update is included in Appendix B. This update should help avoid confusion and unnecessary analyses in future reporting.

- ***AEMP Design Plan Revision #1: The Board requires DDMI to specify the 2013 total nitrogen data is excluded from all trend analyses for the sediment component in an updated AEMP Design Plan for Board staff conformity.***

3.4 Traditional Knowledge

As part of Diavik Diamond Mine's AEMP, a Traditional Knowledge (TK) camp, also known as the AEMP TK Program or Study, takes place every three years.¹⁹ As stated in the Aquatic Effects Re-evaluation Report, the "primary objective of the 2021 AEMP TK Study was to facilitate the two-way flow of information, resources, and knowledge between TK holders and scientists regarding the health of fish and water in Lac de Gras."

The last TK camp that was reported on occurred in 2021 but, in accordance with a Board decision, was included in the 2022 AEMP Annual Report,²⁰ which was approved by the Board.²¹ The 2021 TK Program Report discussed concerns raised during the TK camp about parasites in fish, and the refusal of Elders to eat or taste the fish and water. The 2021 TK Program Report also discussed the additional steps that were undertaken to address outstanding concerns. The TK camp was also discussed in section 13 of the 2020 to 2022 Aquatic Effects Re-evaluation Report.²²

¹⁸ See WLWB Online Registry for [Diavik - 2017-2019 Re-evaluation and QAPP - Reasons for Decision - Jan 31 22.pdf](#).

¹⁹ See WLWB Online Registry for [Diavik - AEMP Design Plan - Version 6.1 - Dec 27 22](#).

²⁰ See WLWB Online Registry for [Diavik - AEMP Annual Report - 2021 - Reasons for Decision - Oct 19 22](#), [Diavik - AEMP Annual Report - 2022 - Part 1 of 6 - Jul 18 23](#), [Diavik - AEMP Annual Report - 2022 - Part 4 of 6 - Mar 31 23](#), [Diavik - AEMP Annual Report - 2022 - Part 5 of 6 - Mar 31 23](#), and [Diavik - AEMP Annual Report - 2022 - Part 6 of 6 - Mar 31 23](#).

²¹ See WLWB Online Registry for [Diavik - AEMP Annual Report - 2022 - Reasons for Decision - May 24 24](#) and [Diavik - AEMP Annual Report - 2022 - Correction to Reasons for Decision - Jul 2 24](#).

²² See WLWB Online Registry for [Diavik - AEMP - 2020 to 2022 Aquatic Effects Re-evaluation Report - Part 2 of 3 - May 8 24](#).

During the public review of the Re-evaluation Report, EMAB submitted several comments pertaining to discussion on the 2021 TK camp. EMAB recommended some revisions to the text to clarify the following:

- that a video of the TK camp was not approved by participants (EMAB comment 36);
- that participants refused to eat fish because of parasites and overall health of the fish (EMAB comment 37 and 38);
- that palatability data does not extend beyond 2018 and that concerns were also raised in 2018 (EMAB comments 38 and 39); and
- that the participants made factual observations rather than those observations being described as beliefs (EMAB comment 39).

In their responses, DDMI indicated that the 2021 TK Program Report provides more details than the Re-evaluation Report but acknowledged that the 2021 TK Program Report did not capture the full extent of the issues that took place during the 2021 TK camp (response to EMAB comments 36, 37, and 38). With regards to the video documentary, DDMI did not agree that changes to the Aquatic Effects Re-evaluation Report were needed as it believes the text to be “sufficiently accurate” for the Aquatic Effects Re-evaluation Report summary (Response to EMAB comment 36). However, addressing EMAB’s comment pertaining to participants’ observations, DDMI agreed that alternative wording would have been more appropriate and indicated text may be revised if directed to do so by the Board (response to EMAB comment 39). DDM also provided additional clarification to address issues raised by EMAB by noting where relevant information can be found in the Aquatic Effects Re-evaluation Report (response to EMAB comments 38 and 39). The Board notes that the 2022 AEMP Annual Report, which included the 2021 TK Program Report, was approved by the Board and that the TK Program Report was identified to be identical to the one available through EMAB’s public registry. The Board also notes that the Aquatic Effects Re-evaluation Report is not intended to reiterate the information provided in Annual Reports, but rather to provide an assessment of long-term trends and potential effects of the Diavik Mine. While some statements pointed out by EMAB could be more comprehensively addressed, the Board understands the information provided to be a synthesized version that still aligns with the content of the 2021 TK Program Report included in the 2022 AEMP Annual Report. The Board is of the view that the proposed revisions to text recommended in EMAB comments 36, 37, 38, and 39, with the exception of statements regarding observation of participants being factual, are not necessary because:

- details of the 2021 TK Program Report have already undergone public review;
- to the Board’s understanding the publicly available versions (through EMAB’s and the WLWB’s online registries) have been agreed to by participants; and
- relevant information addressing some of EMAB’s recommendations is already provided in the Aquatic Effects Re-evaluation Report.

The Board understands, however, that the input from participants of the TK camp are observations rather than beliefs, and are viewed the same as other experts’ findings from the AEMP. The Board thus directs DDMI to revise the text on p. 709 (Section 13.4, paragraph 3) regarding participants’ input per DDMI’s

response to EMAB comment 39 in Version 1.1 of the 2020 to 2022 Aquatic Effects Re-evaluation Report for Board staff conformity. This revision was included in Appendix A.

- ***2020 to 2022 Aquatic Effects Re-evaluation Report Revision #4: The Board directs DDMI to revise the text on p. 709 (Section 13.4, paragraph 3) regarding participants' input per DDMI's response to EMAB comment 39 in Version 1.1 of the 2020 to 2022 Aquatic Effects Re-evaluation Report for Board staff conformity.***

EMAB also commented on the parasite studies completed during the TK camp, noting that the results are presented as presence/absence of parasites and does not quantify parasite loads (EMAB comment 40). EMAB recommended that DDMI clarify that the parasite analysis is based on presence/absence, and to count and identify parasites to determine loads during the 2024 TK camp (EMAB comment 40). In response, DDMI acknowledged the wording used was inaccurate and should refer to occurrence of parasites, not abundance; DDMI highlighted two sentences from Section 13.4 of the Aquatic Effects Re-evaluation Report that could be revised (response to EMAB comment 40). However, regarding the recommendation to quantify parasite loads, DDMI did not agree with this change in methods as it believes it would not reflect the intent of the TK camp and “focus of TK participants during their time in the field should remain on identifying and monitoring indicators of water quality and fish health from a TK perspective” (response to EMAB comment 40). DDMI also indicated that samples from the 2021 TK camp were sent to a laboratory that worked on parasite identification (response to EMAB comment 40). The Board notes that details of this parasite investigation were provided in Appendix XIV of the 2022 AEMP Annual Report. The Board also notes that, per Decision #6 of the 2022 AEMP Annual Report's Reasons for Decision, the Board required DDMI to engage with participants as part of the 2024 TK Camp to understand how to best address potential concerns pertaining to parasite loads in fish.²³ A discussion of this engagement is anticipated to be provided in the 2024 AEMP Annual Report.²⁴ The Board is of the view that wording in the Aquatic Effects Re-evaluation Report should appropriately reflect the data collected and directs DDMI to revise the two sentences in Section 13.4 identified in the response to EMAB comment 40 (item 1 of the recommendation) in Version 1.1 of the 2020 to 2022 Aquatic Effects Re-evaluation Report for Board staff conformity. This revision was included in Appendix A. However, The Board is of the view that requiring quantification of parasites at this time is not appropriate as no Parties have been able to consider this proposed change in methodology. Further, considering the Board's previous decision from the 2022 AEMP Annual Report to engage with participants during the 2024 TK camp, the Board is satisfied that there will be future opportunities to consider how to best to address concerns pertaining to fish parasites that will include TK holder perspectives.

- ***2020 to 2022 Aquatic Effects Re-evaluation Report Revision #5: The Board directs DDMI to revise the two sentences in Section 13.4 as identified in the response to EMAB comment 40 (item 1 of the recommendation) in Version 1.1 of the 2020 to 2022 Aquatic Effects Re-evaluation Report for Board staff conformity.***

²³ See WLWB Online Registry for [Diavik - AEMP Annual Report - 2022 - Reasons for Decision - May 24 24](#).

²⁴ See WLWB Online Registry for [Diavik - AEMP Annual Report - 2022 - Reasons for Decision - May 24 24](#).

EMAB also commented on a statement in Section 13.4 of the Aquatic Effect Re-evaluation Report that parasites “respond to environmental changes outside of Diavik’s control”, recommending that evidence be provided to support the statement (EMAB comment 41). In response, DDMI indicated that factors that can affect parasite abundance are complex, poorly understood, and may interact with one another but include temperature, population fluctuations and abundance of hosts (intermediates and final), and air quality (response to EMAB comment 41). DDMI provided examples of how changes in air quality from forest fires and the ash produced may also affect water quality and influence ecosystems (response to EMAB comment 41). DDMI further clarified that:

The presence of a healthy parasite population in Lac de Gras does, however, suggest a healthy ecosystem in the lake. This is because all necessary components required to support the parasite life cycle (e.g., good water quality, prey for host species, and the host species themselves) must be present and abundant, and in good condition. While parasites in fish are not desirable and generally elicit a large "ick" factor, they do not represent impairment of the ecosystem in Lac de Gras (response to EMAB comment 41).

The Board acknowledges that, while it may be true that influential environmental factors can vary regardless of the presence of the Diavik Diamond Mine, the examples provided also indicate that the presence of the mine could also impact parasite populations. For instance, dust and effluent temperature are monitored as part of the AEMP to assess potential impacts on water quality. The Board also notes that participants of the TK camp were not concerned with the “ickiness” of fish caught but with the safety of consuming fish from Lac de Gras and, although the presence of parasites can indicate a healthy ecosystem, an overabundance may also impair traditional uses. The Board is of the view that DDMI’s response overstates the nature of the conclusions on environmental health that can be drawn from parasite abundance. However, the Board is of the opinion that the concerns regarding parasite abundance and a potential mine-related effect can be further addressed by the Board’s decision on the 2022 AEMP Annual Report, which required DDMI to engage with participants as part of the 2024 TK Camp to understand how to best address potential concerns pertaining to parasite loads in fish (i.e., Decision #6 from the 2022 AEMP Annual Report Reasons for Decision).²⁵ The Board also notes that a workshop discussing the closure/post-closure AEMP and development of a TK-based monitoring program for closure (i.e., TK Watch Program) are required; these may allow for further consideration on how best to address concerns over parasite abundance.²⁶

3.5 Water Quality

Water quality monitoring is a component of the AEMP, which is designed to assess potential mine-related effects in Lac de Gras. Treated effluent chemistry and water quality in Lac de Gras are assessed to determine changes over space and time as well as to confirm predictions made in the Environmental

²⁵ See WLWB Online Registry for [Diavik - AEMP Annual Report - 2022 - Reasons for Decision - May 24 24](#).

²⁶ See WLWB Online Registry for [Diavik - WL Amendment - Decommissioning - RFD and Recommendation to the Minister - Mar 19 24](#) and [Diavik - Final CRP - Version 1 - Reasons For Decision - Jul 19 24](#).

Assessment. Cumulative effects related to the Diavik and Ekati mine discharges are also assessed. Currently, DDMI monitors water quality in Lac de Gras annually. Monitoring parameters include field parameters (e.g., temperature, conductivity), standard physical/chemical parameters (e.g., pH, hardness), major ions, nutrients, and total and dissolved metals.

3.5.1 Dissolved Oxygen

EMAB noted that low oxygen conditions were observed at station MF1-5 during the 2021 ice-covered season (p. 246) but the report did not include a summary of low dissolved oxygen conditions and where the guideline for the protection of aquatic life was not met (EMAB comment 3). EMAB recommended that a summary be included in Section 5.3.2.2.1, which contains the water quality profile data at select monitoring stations. In response, DDMI indicated that the following text could be added to the second paragraph of Section 5.3.2.2.1:

For the period of 2020 to 2022, near-bottom DO concentrations measured at MF1-1 (2020), MF1-5 (2020 to 2023), FF2-5 (2020), and MF3-5 (2020) were at or below the Effects Benchmark of 9.5 mg/L for the protection of aquatic life for early life stages. Some concentrations at MF1-1 (2020), MF1-5 (2020 to 2023), and FF2-5 (2020) were also below the Effects Benchmark of 6.5 mg/L for the protection of aquatic life for “other” life stages (response to EMAB comment 3).

The Board notes that DDMI has referenced a date range for station MF1-5 that includes 2023, which is outside the scope of this report. The Board requires DDMI to include this additional text in an updated version of the Aquatic Effects Re-evaluation Report but update the text to only include references up to 2022. The Board requires this revision for Board staff conformity and has included it in Appendix A.

- ***2020 to 2022 Aquatic Effects Re-evaluation Report Revision #6: The Board directs DDMI to include additional text per response to EMAB comment 3 with a modification to the proposed updated text to only include references up to 2022 in Version 1.1 of the 2020 to 2022 Aquatic Effects Re-evaluation Report for Board staff conformity.***

EMAB also indicated that the plankton section of the Aquatic Effects Re-evaluation Report (section 8.3.4.2) states that the “entire water column has remained well-oxygenated throughout the lake during the period monitored,” which does not align with the results of dissolved oxygen monitoring detailed in Section 5.3.2.2.1 of the Report (EMAB comment 15). EMAB recommended the statement be revised to reflect the information in Section 5.3.2.2.1 (EMAB comment 15). In response, DDMI indicated the statement was intended to be specific to the plankton monitoring stations and the sampling depths at these stations. While DDMI suggested that no changes were needed at this time, it committed to using statements in the future that better reflect the nuance in what is being discussed (response to EMAB comment 15). DDMI also provided an example of what such a nuanced statement may look like (response to EMAB comment 15); the Board understands this revised wording would address EMAB’s recommendation. The Board is of the view that DDMI provided sufficient clarification for the statement and is not concerned with the interpretation of the results of the 2020 to 2022 Aquatic Effects Re-

evaluation Report. The Board considers DDMI's commitment to include more nuanced statements regarding oxygenation of the water column in the future satisfactory as it should ensure the information throughout reports is clear and consistent. No further actions on this item is required at this time.

3.5.2 Design Plan Changes

DDMI has recommended two changes to the water quality component of the AEMP Design Plan:

- Future data analyses for major ions (i.e., calcium, magnesium, potassium, and sodium) be done only on the dissolved form to eliminate duplication of analyses (i.e., total and dissolved forms) that produce nearly identical results.
- Collect top, middle and bottom depth water quality samples only in the NF area, at stations immediately outside the NF area and where the effluent plume has been noted previously (MF1-1, MF2-1, MF2-3, MF3-1, and MF3-2), and at stations providing a one station buffer to allow detecting a potential expansion of the plume to avoid unnecessary sampling where complete mixing of the effluent is occurring.

Board staff asked DDMI to clarify if trend analysis of only the dissolved forms of major ions was being proposed (WLWB staff comment 12). In response, DDMI confirmed that the trend analysis would continue on the total forms because these variables have more data at detectable concentrations in historical years (Response to WLWB staff comment 12). Discontinuation of the analysis of total forms of major ions would only apply to Action Level analyses and spatial analysis of effects included in the AEMP Annual Report. The Board agrees that this change in approach to eliminate redundant analyses is appropriate and approves the proposed change. The Board also requires DDMI to update the AEMP Design Plan to reflect this change in approach related to major ions; this is included in Appendix B.

- ***Decision #7: The Board has decided to approve the proposed change to the spatial analysis of effects and Action Level assessment of major ions to only include the dissolved form.***
- ***AEMP Design Plan Revision #2: The Board requires DDMI to revise the method associated with the spatial analysis of effects and Action Level assessment to include only the dissolved form of major ions in an updated version of the AEMP Design Plan for Board staff conformity.***

Regarding the change in sampling approach and reducing the locations where top, middle, and bottom samples are collected, Board staff asked for clarification regarding whether additional buffer stations would be included if expansion of the effluent plume was detected at stations MF1-3, FF2-2, and MF3-3 and, if so, how that additional monitoring would be triggered (WLWB staff comment 13). EMAB (comment 25) also requested additional information regarding field parameters (i.e., conductivity, temperature, dissolved oxygen, pH, and turbidity) at the remaining mid-field stations and indicated that fully mixed conditions should be confirmed at stations prior to implementing mid-depth only sampling. Board staff further asked DDMI to explain why the recommended reduction in sampling at depth beyond select

stations in the mid-field area will not influence the ability to detect mine-related effects that appear to be reaching the far-field area, as has been reported for chlorophyll *a* (see section 4.6 of these Reasons for Decision) (WLWB staff comment 16). In response, DDMI provided information to support that no signs of effluent-related stratification have been observed at the remaining mid-field stations to date. DDMI also indicated that the buffer station where the plume was detected (e.g., MF1-3, FF2-2, or MF3-3), as well as additional buffer station(s), would be added in subsequent annual sampling and associated reports. DDMI also explained that depth profiles would still be completed for each station in both seasons (response to EMAB comment 25). With regard to eutrophication indicators, DDMI indicated that vertical mixing was generally observed at stations beyond the NF area during both seasons and that similar trends were observed among sampling depths (response to WLWB staff comment 16). Therefore, DDMI believes collection of mid-depth data from mid-field stations would be sufficient to characterize nutrient concentrations and chlorophyll *a*, and the ability to detect mine-related effects would not be compromised (response to WLWB staff comment 16).

Based on these responses, the Board approves this design plan change but requires DDMI to include the clarification of additional buffer stations, and a trigger to include additional top and bottom sampling if field profiles of conductivity indicate the presence of effluent at stations beyond the defined buffer stations in the updated AEMP Design Plan for conformity by Board staff; these have been included in Appendix B. It is the Board's understanding that depth-integrated sampling for eutrophication indicators during open-water season would remain the same as detailed in the currently approved AEMP Design Plan (i.e., Version 6.1); the Board requires DDMI to confirm this understanding in the conformity table of the updated AEMP Design Plan for Board staff conformity. The Board notes that a closure/post-closure AEMP Design Plan is anticipated, and sampling and monitoring requirements may differ.²⁷

- ***AEMP Design Plan Revision #3: The Board has decided to approve the proposed change in sampling depths outside of the identified effluent plume and requires DDMI to update the sampling procedures to reflect the changes related to sample collection at depth in the updated AEMP Design Plan for Board staff conformity.***
- ***AEMP Design Plan Revision #4: The Board requires DDMI to include a field profile conductivity trigger to initiate top, middle, and bottom sampling at stations beyond the currently proposed buffer stations in the updated AEMP Design Plan for Board staff conformity.***
- ***AEMP Design Plan Revision #5: The Board requires DDMI to include text to clarify how additional buffer stations may be added in the updated AEMP Design Plan for Board staff conformity.***
- ***AEMP Design Plan Revision #6: The Board requires DDMI to confirm that depth-integrated sampling for eutrophication indicators during open-water season would***

²⁷ See WLWB Online Registry for [Diavik - Final CRP - Version 1 - Reasons For Decision - Jul 19 24](#).

remain the same as detailed in the currently approved AEMP Design Plan (i.e., Version 6.1) in the conformity table of the updated AEMP Design Plan for Board staff conformity.

3.6 Chlorophyll *a*

Eutrophication indicators, including chlorophyll *a* concentrations, are assessed at far-field stations during comprehensive years (i.e., every three years), while near-field and mid-field areas are also sampled during interim sampling years. The extent of effects on chlorophyll *a* concentration reached the far-field areas with 100% of the lake being affected in 2021 and 61% of the lake in 2022.²⁸ As discussed in the Reasons for Decision on the 2021 and 2022 AEMP Annual Reports, a disconnect in the trends of chlorophyll *a* and phytoplankton biomass was identified in these two years of data where, contrary to expectation, there was an increase in chlorophyll *a* concentrations but not phytoplankton biomass.²⁹ In the Reasons for Decision on the 2021 AEMP Annual Report, the Board required DDMI to “discuss, along with the assessment of chlorophyll *a* concentrations throughout Lac de Gras, whether the elevated chlorophyll *a* concentrations were observed in 2022, how the 2022 findings informed the understanding of chlorophyll *a* trend, and whether additional sampling at FF [far-field] stations is needed with rationale provided in the 2020 to 2022 Aquatic Effects Re-evaluation Report.”³⁰

During the public review of the 2020 to 2022 Re-evaluation Report, EMAB and GNWT-ECC commented on how this decision was addressed (EMAB comment 35; GNWT-ECC comment 10). EMAB recommended clarification be provided on whether additional sampling at far-field stations may be needed (EMAB comment 35) and GNWT-ECC recommended that sampling of chlorophyll *a* be required at far-field stations during interim years (GNWT-ECC comment 10). GNWT-ECC noted that, while chlorophyll *a* concentrations in 2022 were below those reported in 2021, the overall trends suggest an increase in chlorophyll *a* concentrations in the far-field area since 2013 with recent concentrations above the normal range (GNWT-ECC comment 10). GNWT-ECC indicated its recommendation would apply for a short-term and may help better understand trends of nutrient enrichment in the lake (GNWT-ECC comment 10). In response, DDMI stated its view that:

The available chlorophyll *a* dataset (i.e., without additional FF data) was sufficient to detect an overall increasing trend in chlorophyll *a* concentrations in the NF and some MF areas over the last three years (Section 7.3.3.3). Sampling at the FF stations in the interim years would not have changed the spatial extent of effect determination in any year since 2015. The current sampling design provides sufficient information to support the Action Level assessment and additional sampling at FF stations during interim years is not needed.

²⁸ See WLWB Online Registry for [Diavik - AEMP - 2020 to 2022 Aquatic Effects Re-evaluation Report - Part 1 of 3 - May 8 24](#).

²⁹ See WLWB Online Registry for [Diavik - AEMP Annual Report - 2021 - Reasons for Decision - Oct 19 22](#) and [Diavik - AEMP Annual Report - 2022 - Reasons for Decision - May 24 24](#).

³⁰ See WLWB Online Registry for [Diavik - AEMP Annual Report - 2021 - Reasons for Decision - Oct 19 22](#).

It is unclear to the Board whether additional chlorophyll *a* sampling in the far-field area may be appropriate at this time considering that closure of the site is imminent and mine outputs are expected to be reduced with the end of operations. The Board notes that an updated AEMP Design Plan is anticipated for closure and the Board has required further engagement through a workshop that will include discussion of the linkage between the AEMP and FCRP.³¹ The Board is of the view that this workshop will provide an opportunity to consider suitable monitoring requirements pertaining to eutrophication indicators. The Board is of the view that no further action is needed at this time.

3.7 Plankton

Section 8 of the Aquatic Effects Re-evaluation Report discusses results of plankton sampling, including phytoplankton and zooplankton. Plankton sampling has been occurring in Lac de Gras since 1995 with the collection of baseline data and has evolved over time to include evaluation of abundance, biomass, and community structure.³²

3.7.1 Phytoplankton Richness

Section 16 of the Plain Language Summary of the 2020 to 2022 Aquatic Effects Re-evaluation Report outlined several proposed updates to the AEMP Design Plan. One of these recommendations was to “drop phytoplankton richness from the Action Level evaluation because comparing richness to the normal range is unlikely to produce reliable results given the observed differences between data sets produced by different taxonomists during recent monitoring years.”³³

During the public review of the 2020 to 2022 Aquatic Effects Re-evaluation Report, EMAB commented on the recommendation to remove phytoplankton richness from the Action Level evaluation and recommended this evaluation be retained (EMAB comment 33). EMAB indicated that the current framework does not appear to have resulted in inaccurate exceedances as the Aquatic Effects Re-evaluation Report noted that phytoplankton richness has not triggered an action level exceedance from 2007 to 2022 (EMAB comment 33). In response, DDMI reiterated its view that phytoplankton richness should be removed from the Action Level evaluation because of the inconsistencies between taxonomists but did not provide rationale for why this approach would be preferable to adjusting the normal range (response to EMAB comment 33). The Board is of the view that richness is an important and commonly used indicator of environmental health and does not agree with its removal without alternative means to address this gap. As no Action Levels have previously been triggered for phytoplankton richness, the Board is not concerned that inaccurate exceedances may be detected; if an exceedance occurred, results would be discussed and issues pertaining to taxonomy can then be further investigated. The Board has decided not to approve dropping phytoplankton richness from the Action Level evaluation at this time.

³¹ See WLWB Online Registry for [Diavik - WL Amendment - Decommissioning - RFD and Recommendation to the Minister - Mar 19 24](#) and [Diavik - Final CRP - Version 1 - Reasons For Decision - Jul 19 24](#).

³² See WLWB Online Registry for [Diavik - AEMP - 2020 to 2022 Aquatic Effects Re-evaluation Report - Part 2 of 3 - May 8 24](#).

³³ See WLWB Online Registry for [Diavik - AEMP - 2020 to 2022 Aquatic Effects Re-evaluation Report - Part 1 of 3 - May 8 24](#).

➤ ***Decision #8: The Board has decided not to approve dropping phytoplankton richness from the Action Level evaluation at this time.***

As an alternative to dropping this evaluation, EMAB indicated that adjusting the normal range may be an option (EMAB comment 33). EMAB noted this option was discussed in the Aquatic Effects Re-evaluation Report, which stated that, if this adjustment approach was taken, exceedance of the normal range would not have occurred (EMAB comment 33). DDMI did not provide a response to this part of EMAB's recommendation. In Sections 8.3.5 and 8.5 of the Re-evaluation Report, DDMI had included the recommendation to adjust the normal range, indicating it would represent an upward shift of 12 taxa based on the average difference observed between taxonomists. It is unclear to the Board why DDMI did not further discuss the recommendation to alter the normal range or referenced the recommended adjustment in response to EMAB's comment. Section 3.8.5 of the Aquatic Effects Re-evaluation Report indicated that the adjustment of the normal range by 12 taxa would result in no exceedances of the normal range being detected and, as a result, would change the interpretation of the 2020 to 2022 results in the near-field and mid-field areas. The Aquatic Effects Re-evaluation Report also stated that the "results of the taxonomist comparison highlight the importance of retaining the same taxonomist for an entire monitoring program; however, as demonstrated during this AEMP, that is frequently not possible nor within the control of the proponent." It is unclear to the Board how DDMI developed the proposed approach for adjusting the normal range and whether other projects have used this approach. Given that other facilities in the north monitor plankton and would encounter taxonomist changes, it would be helpful to understand if similar issues have been encountered and, if so, how these have been addressed. There is no way to predict if and/or when changes in taxonomists may occur in the future and a clear understanding of the potential implications of making adjustments such as the one proposed by DDMI is necessary. Further, it is unclear how adjusting the normal range would benefit the interpretation of the results; the 2020 to 2022 Aquatic Effects Re-evaluation Report states that the detection of mine-related effects is best done using gradient analysis, which does not depend on the normal range. The Board is of the opinion that there is a lack of clarity with the proposed approach to adjusting the normal range of phytoplankton richness and that further information to support this approach would be required; therefore, the Board has decided not to approve the adjustment of the normal range for phytoplankton richness at this time.

➤ ***Decision #9: The Board has decided not to approve the adjustment of the normal range for phytoplankton richness at this time.***

EMAB noted that, if the differences associated with different taxonomists warranted an adjustment of the normal range, then perhaps the data sets that the normal range is based on should also be adjusted and analyses using the adjusted data be provided (EMAB comment 12). As the Board has not approved the adjustment to the normal range, this recommendation is considered addressed.

3.7.2 *Diatom and Microflagellates Biomass Normal Ranges*

As stated in Section 16 of the plain language summary of the Aquatic Effects Re-evaluation Report, DDMI recommended adjusting the normal ranges for total and relative diatom and microflagellate biomass for future AEMPs to provide a more appropriate range of natural variability.³⁴ The Re-evaluation Report stated that:

Comparisons of the 2020 to 2022 FF data to the normal ranges was effective for total biomass (Figure 8-49) and biomass of most of the major phytoplankton groups, except for microflagellates and diatoms... (Figures 8-50 and 8-51). An under-representation of the range of natural variability in the FF areas often results in more exceedances of the normal range.

[...]

Diatom biomass in the NF, MF, and FF areas, has consistently surpassed the 2013 adjusted normal range between 2013 and 2022 (Figure 8-51). This suggests that the existing diatom normal range may not adequately capture the full extent of natural variability in diatom biomass and that the 2013 adjusted normal range was based on a year when there was little variability in diatom biomass in the FF areas. It is recommended that the normal range for diatom biomass be adjusted for future AEMPs to provide a more appropriate range of natural variability...

The recommended adjustments would increase the upper limit of the normal range of diatom biomass by approximately 20 mg/m³ and of the microflagellate biomass by approximately 100 mg/m³.

GNWT-ECC and Board staff commented on this recommendation. GNWT-ECC and staff indicated it was unclear how the adjustments of 20 mg/m³ and 100 mg/m³ were derived (GNWT-ECC comment 6; WLWB staff comment 19). Board staff also indicated it was unclear why the values above the normal range are assumed to reflect an incorrect normal range rather than a Mine-related effect (WLWB staff comment 19). GNWT-ECC recommended that DDMI clarify what data was used to determine the adjustment to the normal range (GNWT-ECC comment 6); Board staff asked a similar question (WLWB staff comment 19). GNWT-ECC also recommended DDMI discuss how this determination may be impacted by the increased nutrient response in chlorophyll *a* that was reported in 2021 and 2022 (see Section 4.6 of these Reasons for Decision) (GNWT-ECC comment 6). DDMI indicated in its response that the revision to the normal range would account for discrepancies among taxonomists based on far-field observations and that the observed nutrient enrichment is unlikely to affect the proposed adjustment as it relies on variations in the far-field areas of Lac de Gras (responses to GNWT-ECC comment 6 and WLWB staff comment 19). It is the Board's understanding that DDMI chose to rely on observations from far-field areas because the data in those areas should most represent natural variation because the stations are furthest from the Diavik

³⁴ See WLWB Online Registry for [Diavik - AEMP - 2020 to 2022 Aquatic Effects Re-evaluation Report - Part 2 of 3 - May 8 24](#).

Mine. It is unclear to the Board what benefit adjusting the normal range for biomass of diatoms and microflagellates provides at this time because of the following:

- no Action Levels are based specifically on diatom and/or microflagellate biomass;
- diatoms and microflagellates constitute a small portion of the total phytoplankton biomass, and DDMI has indicated that the normal range for phytoplankton biomass remained appropriate (response to WLWB staff comment 19);
- phytoplankton biomass has not triggered an Action Level since 2016; and
- per the Re-evaluation Report, gradient analyses are best to assess mine effects on these parameters.

The Board also notes that diatom and microflagellate biomass appear to undergo cycles where increases are later followed by decreases (Figures 8-4 and 8-10 of the 2020 to 2022 Aquatic Effects Re-evaluation Report). These cycles can be observed in all areas (near-, mid-, and far-field) and the Re-evaluation Report indicated that 2013 was a year of particularly low variability. It is unclear whether basing the normal range on the entirety of the far-field data is appropriate rather than selecting a year other than 2013 to determine the normal range. The Board is of the opinion that the information provided at this time does not justify adjusting the normal range of diatom and microflagellate biomass with the suggested approach and magnitude. Therefore, the Board has decided not to approve the adjustment to the normal ranges for total and relative diatom and microflagellate biomass at this time.

- ***Decision #10: The Board has decided not to approve the adjustment to the normal ranges for total and relative diatom and microflagellate biomass at this time.***

3.7.3 Community Structure

DDMI has determined that the changes in phytoplankton taxonomists over the years have influenced the data, which resulted in taxonomist-related groupings. Although year-to-year differences are still evident in these groupings, the presence of the groupings suggests that the observed differences may have been influenced by the taxonomist. Currently, DDMI separates the data into two ordination plots based on year (i.e., 2002 to 2012 and 2013 onward) but has proposed to alter the approach in future re-evaluations and separate the data into three ordination plots: (1) 2002 to 2012; (2) 2013 to 2019; and (3) 2020 onward. This approach should help determine year-to-year differences are not masked by taxonomist differences.

GNWT-ECC indicated support for this proposed change but suggested that DDMI should apply this approach in the current re-evaluation rather than waiting for another three years (GNWT-ECC comment 5). GNWT-ECC suggests this update is warranted to know what effect, if any, the changed analysis methods proposed in Section 8.3.4 have on the interpretations of the data in this re-evaluation (GNWT-ECC comment 5). In response, DDMI stated the following:

DDMI will consider using the suggested data groupings (i.e., 2003 to 2012, 2013 to 2019, and 2020 onward) in future re-evaluation reports. DDMI does not believe there is added value in presenting a reanalysis of the data already considered in the 2020 to 2022 re-

evaluation report, because although the recommended analysis would likely be an improvement, it is unlikely to change the overall interpretation of the phytoplankton community data. No changes to the report are recommended (Response to GNWT-ECC comment 5).

Although having an understanding of the magnitude of the taxonomist influence on the community structure data, DDMI has indicated that these differences would result in little to no change in the overall interpretation of the phytoplankton community structure. The Board requires DDMI to apply the revised approach for phytoplankton community assessment using three ordinations based on the proposed date divisions in the next Aquatic Effects Re-evaluation Report. However, no further action to provide revised ordinations as part of the 2020 to 2022 Aquatic Effects Re-evaluation Report is required at this time.

- ***Decision #11: The Board requires DDMI to apply the revised approach for phytoplankton community assessment using three ordinations based on the proposed date divisions of 2002 to 2012, 2013 to 2019, and 2020 onward in the next Aquatic Effects Re-evaluation Report.***

3.7.4 Zooplankton Biomass

An Action Level 2 exceedance for zooplankton biomass was reported in 2016 that DDMI deemed not to be a concern.³⁵ DDMI deemed this exceedance to not be a concern in part based on the zooplankton ash-free dry mass (AFDM) results that indicated that the conditions that triggered the Action Level in 2016 were not observed in 2017. Zooplankton ADFM was a supporting variable in the AEMP that was used to help evaluate zooplankton biomass; but it was removed in Version 6 of the AEMP Design Plan because it was shown to be redundant with zooplankton biomass based on enumeration.³⁶ Board staff asked DDMI to confirm whether zooplankton biomass based on enumeration provides the same supporting rationale as the AFDM results with regard to the 2015 and 2016 Action Level exceedances (WLWB staff comment 18). DDMI confirmed that the 2016 Action Level exceedance was triggered based on zooplankton biomass that was found to be lower in the near-field and mid-field areas, but that it was concluded to likely be due to spatial variations within Lac de Gras (response to WLWB staff comment 18). In its response, DDMI identified three lines of evidence to support its conclusion and indicated that the biomass by enumeration was the only result pointing to a toxicological impairment, as opposed to the nutrient enrichment as suggested by AFDM (response to WLWB comment 18). DDMI's response did not directly address the question of comparability of rationale between AFDM and enumeration biomass. However, the Board understands that plankton data can be variable and DDMI's response indicated that no other lines of evidence pointed at a toxicological response in 2016. The Board notes that no other Action Levels have been triggered for zooplankton biomass based on either enumeration or AFDM from 2016 until the approval of Version 6 of the AEMP Design Plan in 2022. The Board also note that an updated AEMP Design

³⁵ See WLWB Online Registry for [Diavik - AEMP Annual Report - 2016 - Mar 31 17](#) and [Diavik - AEMP Annual Report - 2017 - Reasons for Decision - Mar 25 19](#).

³⁶ See WLWB Online Registry for [Diavik - AEMP Design Plan - Version 6.0 - Apr 21 22](#) and [Diavik - AEMP Aquatic Effects Re-eval Addendum and Design Plan V6.0 - Reasons for Decision - Sep 2 22](#).

Plan is anticipated for closure, which can provide an opportunity to address outstanding concerns pertaining to monitoring requirements.³⁷ No further actions on this item is required at this time.

3.8 Benthic Invertebrates Density Threshold

The 2022 AEMP Annual Report indicated that the “5% density threshold for including benthic invertebrate taxa in the statistical analysis may need to be adjusted to account for taxa with highly variable but low densities, like *Stictochironomus*, which have limited indicator value.”³⁸ The 2022 AEMP Annual Report indicated this recommendation would be further discussed in the 2020 to 2022 Aquatic Effects Re-evaluation Report.³⁹ Section 16 of the Plain Language Summary and Section 9.5 of the 2020 to 2022 Aquatic Effects Re-evaluation Report included the recommendation to “apply the 5% density threshold for benthic invertebrate taxa after the exclusion of anomalous values that may skew overall density.”⁴⁰

During the public review of the Aquatic Effects Re-evaluation Report, EMAB and GNWT-ECC did not support implementing DDMI’s recommendation for the change in approach regarding the 5% density threshold for benthic invertebrate taxa. EMAB stated that a longer period of time may be needed to observe trends and/or detect mine effects since benthic invertebrate sampling occurs only during comprehensive years (i.e., every three years) (EMAB comment 26). EMAB maintained its recommendation from the 2022 AEMP Annual Report review that the 5% threshold should continue to be used for all taxa, including the ones with variable densities like *Stictochironomus*; EMAB indicated that continuing to use currently approved data analyses will ensure consistent interpretation of the results (EMAB comment 26). EMAB also commented that the basis of the statement that the *Stictochironomus* taxon has limited indicator value is unclear and recommended that rationale be provided for it (EMAB comment 26). EMAB indicated that this statement may relate to the historical occurrence of *Stictochironomus* in Lac de Gras but noted that other taxa showed variations in density over time (EMAB comment 26). GNWT-ECC noted that the recommendation appears to be based on the results of a single taxon but would impact an unknown number of taxa and it may result in downweighting rare taxa in future analyses (GNWT-ECC comment 7). GNWT-ECC further stated that “spatial variability in benthic taxa is not uncommon and therefore removing taxa due to high variability in density may result in a loss of information” (GNWT-ECC comment 7). GNWT-ECC stated that it does not believe sufficient rationale has been provided to justify changing methodology and recommended that outliers in the density data should be included in analyses unless they were known to be due to errors in collection or enumeration (GNWT-ECC comment 7). In response, DDMI stated that:

In the AEMP, common taxa are subject to additional statistical analyses that are not designed to be applied to rare or uncommon taxa. Ideal indicator taxa are observed at many stations in multiple years. This allows for identification of differences from the reference condition data set, and trends in density over time and along gradients through

³⁷ See WLWB Online Registry for [Diavik - Final CRP - Version 1 - Reasons For Decision - Jul 19 24](#).

³⁸ See WLWB Online Registry for [Diavik - AEMP Annual Report - 2022 - Part 1 of 6 - Jul 18 23](#).

³⁹ See WLWB Online Registry for [Diavik - AEMP Annual Report - 2022 - Part 1 of 6 - Jul 18 23](#).

⁴⁰ See WLWB Online Registry for [Diavik - AEMP - 2020 to 2022 Aquatic Effects Re-evaluation Report - Part 1 of 3 - May 8 24](#).

statistical analysis. Statistical analysis of densities of taxa that are present at few stations and at very low densities do not provide meaningful results for evaluating mine-related effects, which is the original reason for developing the 5% criterion.

[...]

The recommended update to the 5% criterion for identifying common taxa, so that the data compared to the 5% criterion exclude anomalously high values, would mean that *Stictochironomus* in 2022 would not have been considered a common taxon. However, if the updated 5% criterion were applied to the 2022 AEMP, *Stictochironomus* would still have been included in other benthic invertebrate variable calculations, and the analyses of those variables [...] DDMI maintains the recommendation to [...] avoid reporting potentially misleading results (Response to GNWT-ECC comment 7).

The Board acknowledges that the current application of the 5% threshold may result in additional analyses of taxa that may be anomalous; however, DDMI did not indicate this causes statistical issues but rather seems to be a consideration for the interpretation of results. Considering the concerns from Parties that information may be lost by the proposed change in methodology and that the potential issues can be handled by discussing the interpretation of the results, the Board has decided not to approve the modification of the 5% density threshold for benthic invertebrate taxa after the exclusion of anomalous values and directs DDMI to maintain the use of the 5% threshold as detailed in Version 6.1 of the AEMP Design Plan. The Board notes that an updated AEMP Design Plan is anticipated for closure and the Board has required further engagement through a workshop that will include discussion of the linkage between the AEMP and FCRP.⁴¹

- ***Decision #12: The Board has decided not to approve the modification of the 5% density threshold for benthic invertebrate taxa after the exclusion of anomalous values and directs DDMI to maintain the use of the 5% threshold as detailed in Version 6.1 of the AEMP Design Plan.***

3.9 Fish Tissue Component

There are two programs for the fish component of the AEMP: fish health and fish tissue. A small-bodied fish species, Slimy Sculpin, is the primary monitoring species for both fish health and fish tissue. Lake trout are the large-bodied fish species that have been used for monitoring fish tissue.

3.9.1 Missing Lake Trout Tissue Chemistry Data and Results

EMAB noted that 2022 Lake Trout tissue chemistry (i.e., mercury concentrations in muscle) data were presented in the 2020 to 2022 Aquatic Effects Re-evaluation Report, but that these data were not included in the 2022 AEMP Annual Report (EMAB comment 17). EMAB recommended that the 2022 AEMP Annual Report be updated to include these results (EMAB comment 17). In response, DDMI noted that these data

⁴¹ See WLWB Online Registry for [Diavik - Final CRP - Version 1 - Reasons For Decision - Jul 19 24](#).

were collected as part of a special TK follow-up study, which was conducted to address community concerns about parasites in fish in Lac de Gras. DDMI indicated that the results of this TK study were provided to EMAB and the communities in a format outside of the AEMP Annual Report in 2023, which included a presentation, technical memorandum, and a plain language pamphlet (Response to EMAB comment 17).

The Board has already approved the 2022 AEMP Annual Report and further updates to that report are considered to be outside the scope of this current review; however, the Board notes that the LWB *Document Submission Standard* require environmental reports to be accompanied by the raw data. The majority of the data that the 2020 to 2022 Aquatic Effects Re-evaluation Report is based on were provided through the respective AEMP Annual Reports; the exception to this is the 2022 TK follow-up study Lake Trout chemistry results. As such, the Board requires DDMI to provide these raw data in unsecured Excel format per the LWB *Document Submission Standards* within 60 days of this Board decision to be added to the WLWB online public registry. This information would not undergo public review as the results have already been considered through the review of this Aquatic Effects Re-evaluation Report.

- ***Decision #13: The Board requires DDMI to provide the 2022 TK follow-up study Lake Trout tissue chemistry raw data in unsecured Excel format per the LWB Document Submission Standards within 60 days of this Board decision to be added to the WLWB online public registry.***

3.9.2 2016 Lake Trout Tissue Chemistry Data

During the Decommissioning Licence Amendment (see DDMI response to EMAB intervention 11.10) and the review of the Final Closure and Reclamation Plan (see DDMI response to EMAB comment 168), EMAB identified issues with the 2007 and 2016 Slimy Sculpin data.⁴² Specifically, EMAB noted the 2007 data were biased high and that the 2016 results were problematic due to the inadvertent omission of livers from the laboratory analysis. DDMI provided recalculated results with these two datasets removed.

In this Aquatic Effects Re-evaluation Report, Board staff noted that DDMI had removed 2007 data but retained 2016 data and applied a correction factor with a caveat to interpret the results with caution (WLWB staff comment 20). Board staff asked for clarification for why DDMI chose what appeared to be an inconsistent approach in relation to the 2016 dataset and what, if any, implications that may have on the interpretation of results (WLWB staff comment 20). In response, DDMI acknowledged removal of the 2016 data was considered but opted to retain the data for transparency. DDMI noted that the application of a tissue correction factor to account for the omission of liver tissues resulted in data that were generally comparable to the other years sampled, indicating it was appropriate to retain the 2016 data in the trend analysis (Response to WLWB staff comment 20). Potential exceptions included cadmium, copper, and molybdenum, which were elevated across sampling areas in 2016; however, DDMI stated that this did not

⁴² See WLWB Online Registry for [Diavik - WL Amendment - Decommissioning - DDMI Response to Interventions - May 9 23](#) and Online Review System for [Diavik - Final Closure and Reclamation Plan \(FCRP\)](#).

affect the interpretation of temporal trends in subsequent years, which were primarily based on the results of the 2019 and 2022 AEMP monitoring results (Response to WLWB staff comment 20).

The Board previously provided direction to Diavik regarding the 2016 Slimy Sculpin fish tissue data:

2020 to 2022 Aquatic Effects Re-evaluation Report Requirement #3: The Board requires DDMI to provide an assessment of the impact of the 2016 data on temporal trend assessments of Slimy Sculpin fish tissue and determine if these data should be retained.⁴³

Given DDMI provided a revised analysis with the 2016 Slimy Sculpin data removed from the data set during the Decommissioning Licence Amendment, it is unclear why DDMI would not provide these same updated results in this re-evaluation. As such, the Board requires DDMI to provide the revised analysis with the 2007 and 2016 data removed in the updated version of the 2020 to 2022 Aquatic Effects Re-evaluation Report. The Board notes that these updated results have already undergone public review through the Decommissioning Licence Amendment proceeding; thus, this revision is to be considered for confirmation of conformity by Board staff and has been included in Appendix A.

- ***2020 to 2022 Aquatic Effects Re-evaluation Report Revision #7: The Board requires DDMI to provide the revised analysis with the 2007 and 2016 data removed in the updated version of the 2020 to 2022 Aquatic Effects Re-evaluation Report for conformity by Board staff.***

3.9.3 Fish Tissue Critical Effect Size Calculations

EMAB stated that “[i]n the summary of sculpin fish health in Table 10-27 (p. 677), the CES was not exceeded in 2022 for any of the metrics. However, only the metrics that triggered action levels (Section 10.2.2.10, p. 634) were assessed for CES” (EMAB comment 21). EMAB requested clarification regarding how DDMI determined that the CES was not exceeded in 2022 for any of the metrics if only the metrics that triggered action levels were assessed for CES (EMAB comment 21). DDMI provided the following information in response:

The results presented in Table 10-27 include CES comparisons for each of the parameters shown and were not limited to the endpoints that triggered action levels described in Section 10.2.2.10. Effect sizes for all endpoints were provided in Appendix V, Table 3-11 and Table 3-13 of the AEMP 2022 Annual Report. As the re-evaluation report does not repeat supporting information provided in the annual reports, DDMI does not believe changes to the re-evaluation report are necessary (Response to EMAB comment 21).

The Board acknowledges DDMI’s response and notes that this information resolves the concern raised by EMAB. However, the Board noted that there is a discrepancy between the 2022 statistical summary in Table 10-27 (p. 677) and the results provided in Section 10.2.2.10 (p. 634). Specifically, Table 10-27 indicates a significant difference in the condition of adult male Slimy Sculpin, but this should be a

⁴³ See WLWB Online Registry for [Diavik - 2017-2019 Re-evaluation and QAPP - Reasons for Decision - Jan 31 22.pdf](#).

significant difference in the condition of fish at age +1. Given the importance of these statistical results and that it is most likely that reviewers will refer to summary tables such as Table 10-27 rather than reviewing detailed results provided in earlier sections, the Board requires DDMI to provide a revised Table 10-27 in the updated version of the 2020 to 2022 Aquatic Effects Re-evaluation Report and recommends DDMI complete a full QA/QC check of the summary table to confirm no other errors have inadvertently occurred. The Board requires this update to be for conformity by Board staff and it was included in Appendix A.

- ***2020 to 2022 Aquatic Effects Re-evaluation Report Revision #8: The Board requires DDMI to provide a revised Table 10-27 in an updated version of the 2020 to 2022 Aquatic Effects Re-evaluation Report for Board staff conformity.***

3.9.4 Regional Comparison of Lake Trout Mercury Tissue Concentrations

DDMI included reference to mercury concentrations in Lake Trout in other lakes to provide a regional context. This included lakes used as reference lakes, as well as lakes exposed to diamond mine effluent at the Snap Lake site, Gahcho Kué site, and the Ekati site. GNWT-ECC provided its opinion that the details DDMI provided were insufficient to support that the concentrations in Lac du Sauvage and Lac de Gras, which exceeded the US EPA guideline, are typical and not a result of mine activity in the lake nor a cause for concern (GNWT-ECC comment 9). GNWT-ECC recommended that DDMI expand the assessment of the mercury concentrations in fish tissue of Lac de Gras and Lac du Sauvage in comparison to regional lakes (GNWT-ECC comment 9). In response, DDMI noted the following:

...the mean and range of mercury concentrations provided for fish sampled from other lakes in the NWT represent unadjusted mercury concentrations in Lake Trout collected from reference lakes only and are directly comparable to the values presented from 1996 to 2022 for Lac de Gras in Table 10-26. These concentrations were also below the mean mercury concentration reported in Lockhart et al, (2005) of 0.384 mg/kg ww for 1,855 Lake Trout sampled from lakes throughout the Northwest Territories, Nunavut, and the Yukon; these fish often exceeded the guideline of 0.5 mg/kg ww for commercial sale (Response to GNWT-ECC comment 9).

DDMI reiterated that the intent of the comparisons was to provide regional context and demonstrate that mercury concentrations in Lac de Gras and Lac de Sauvage have remained relatively constant over time and that there is no indication that mercury concentrations have increased as a result of mining activities. DDMI indicated that the additional information provided in the response could be added to the Report for clarification if required (Response to GNWT-ECC comment 9). The Board requires DDMI to include the additional clarifying text provided in response to GNWT-ECC comment 9 in the updated 2020 to 2022 Aquatic Effects Re-evaluation Report to avoid potential confusion in future assessments and reporting. This item has been included in Appendix A.

- ***2020 to 2022 Aquatic Effects Re-evaluation Report Revision #9: The Board requires DDMI to include the additional clarifying text provided in response to GNWT-ECC***

comment 9 in the updated 2020 to 2022 Aquatic Effects Re-evaluation Report for Board staff conformity.

3.9.5 Power Analysis for Lake Trout Mercury Concentrations

EMAB (comment 34) noted that Directive 1(e) in the Board's August 25, 2022, Reasons for Decision for the 2017 to 2019 Aquatic Effects Re-evaluation Report Addendum and AEMP Design Plan, Version 6.0 required DDMI to "[i]nclude the discussion of the results of the power analysis of mercury in Slimy Sculpin as provided in response to EMAB comment 9 on the 2017 to 2019 Aquatic Effects Re-evaluation Report Addendum. DDMI shall consider these results when proposing the response framework for fish tissue or criteria for triggering a mercury in Lake Trout survey." EMAB noted that DDMI included a single statement regarding this (i.e., power analysis was sufficient to detect differences in mercury concentrations), which in EMAB's view was not adequate discussion to meet the directive requirement (EMAB comment 34). In response, DDMI provided a detailed discussion to support why the power was considered to be adequate to detect effects in Slimy Sculpin, but stated the following regarding why no discussion was included regarding Lake Trout:

Inference from the Slimy Sculpin power analysis to Lake Trout is intentionally not included, as the differences between the two fish species (e.g., diet, trophic level, life history) undoubtedly influences the variability in mercury concentrations within each species to an unknown degree, and precludes this being a defensible comparison. Sample sizes for a Lake Trout survey would be proposed in a sampling plan as part of a Response Plan following an Action Level 3 exceedance for approval by the WLWB (Response to EMAB comment 34).

The Board acknowledges DDMI's clarification and agrees that inferring power results for Lake Trout from Slimy Sculpin power analysis results would not be defensible. The Board notes that if a Lake Trout survey is triggered as a response action, this would require the submission of a response plan for Board approval. This response plan would outline the survey design, which would include sample sizes and a discussion of statistical power. As such, no further action on this matter is required at this time.

3.9.6 Summary and Conclusions for Slimy Sculpin Tissue Chemistry

EMAB noted that DDMI included the following concluding statement related to tissue concentration of bismuth, lead, and uranium in Slimy Sculpin on p. 678 of the 2020 to 2022 Aquatic Effects Re-evaluation Report:

Spatial gradients were observed for bismuth, lead, and uranium that exceeded normal ranges in the NF area; however, concentrations of these metals did not exhibit an upward trend over time, suggesting differences may reflect spatial variation in these parameters, rather than an effect of Mine effluent (EMAB comment 22).

EMAB noted the following lines of evidence, which in their opinion, links these differences in tissue concentrations to the mine:

1. sediment quality results - all three metals were above the normal range in the NF [near-field] area and time series plots for bismuth, lead, and uranium indicate that the concentrations of these metals increased at the mixing zone boundary and in the NF area in 2002, following the initiation of operations. No increasing trends were observed for any of these metals. The report indicates that activities related to dike construction may have increased concentrations of these metals in sediment (e.g., see p. 287). p. 715 indicates that "while effluent discharge was likely the primary source of these metals [including bismuth, lead, and uranium] in the NF area, dike construction may also have contributed to the observed patterns"; and
2. water quality - lead periodically, and uranium consistently, triggered action levels over the period of 2007-2022. Furthermore, there is no indication of an increasing trend in effluent loads of uranium (see for example p. 190: "Effluent loads and concentrations have varied considerably over time without demonstrating any consistent trends."). Detailed effluent and water quality results for bismuth are not presented in the report.

In the absence of increasing trends in sediments or effluent/water, an increasing trend in concentrations in fish - particularly short-lived sculpin - may not be expected. Ultimately, the results strongly indicate the higher concentrations in the NF are linked to the mine (EMAB comment 22).

On p. 287 of the 2020 to 2022 Aquatic Effects Re-evaluation Report, DDMI notes the following:

Uranium is a water quality SOI [substance of interest], and lead is regularly detected in the effluent, which suggests effluent is a likely source of these two metals. Bismuth is typically not detected in the effluent or at AEMP water quality sampling stations at the standard DL [detection limit] of 0.0002 µg/L, suggesting there is another source of this metal to the sediments. The response patterns identified in this report for bismuth, lead, and uranium in bottom sediments are consistent with the results of the dike monitoring studies (e.g., DDMI 2011), which identified greater concentrations of these metals in the vicinity of the Mine effluent diffusers, as well as near the A154 and A418 dikes. Results of the most recent dike monitoring study indicated that bismuth, lead, and uranium concentrations were greatest along the two transects closest to the diffusers, and concentrations decreased with distance along each of these transects. Concentrations of these metals at transects farther away from the effluent discharge were lower, but they still demonstrated gradual decreases with distance away from the dikes. These results

indicate that activities related to dike construction may have contributed to the increased concentrations of these metals observed in sediment.⁴⁴

The Board notes there is a contradiction regarding the suspected source of bismuth. Although the text on p. 715 includes bismuth in the list of parameters suspected to be linked to the effluent, this contradicts information provided on p. 287 that indicates bismuth is typically non-detectable in the effluent or at the AEMP water quality stations but has been linked to the construction of the dikes. Regardless, both sources (effluent discharge and dike construction) are considered mine-related activities.

Slimy Sculpin are bottom-dwelling fish, which naturally results in more contact with sediments than fish that tend to occur higher in the water column. As a result, if the sediments are a source of these three metals and concentrations of these metals in sediments have been influenced as a result of mine-related activities, then the increased tissue concentrations would be considered a mine-related effect. The Board acknowledges that the text on p. 678 of the 2020 to 2022 Aquatic Effects Re-evaluation Report indicates DDMI's opinion that the increased concentrations of bismuth, lead, and uranium is not related to the mine effluent. Based on the information provided on p. 287, it would seem this is true for bismuth, but the ongoing input of lead and uranium in the effluent in conjunction with past effects that have been related to dike construction suggests that there is likely a combined effect that includes both sources. The Board agrees with DDMI that despite the increased concentrations, there is no evidence of a toxicological response in Slimy Sculpin, but that DDMI should reconsider the concluding statement regarding the cause(s) for these three metals. The Board requires DDMI to revisit and revise the conclusions related to concentrations of bismuth, lead, and uranium in Slimy Sculpin tissue to reflect that these are mine-related effects in the updated 2020 to 2022 Aquatic Effects Re-evaluation Report for conformity by Board staff. This revision was included in Appendix A.

- ***2020 to 2022 Aquatic Effects Re-evaluation Report Revision #10: The Board requires DDMI to revisit and revise the conclusions related to concentrations of bismuth, lead, and uranium in Slimy Sculpin tissue to reflect that these are mine-related effects in the updated 2020 to 2022 Aquatic Effects Re-evaluation Report for conformity by Board staff.***

3.9.7 Fish Tissue Chemistry Response Framework

DDMI included a proposed response framework for fish tissue chemistry for mercury concentrations. The Board provided previous direction in the August 25, 2022, Reasons for Decision for the 2017 to 2019 Aquatic Effects Re-evaluation Report Addendum and AEMP Design Plan, Version 6.0. This direction required DDMI to develop a response framework for fish tissue chemistry, which required the inclusion of mercury but did not specifically limit the Response Framework to only that parameter. Board staff asked for further information to clarify why DDMI limited the Response Framework to mercury (WLWB staff comment 22). EMAB also questioned why the response framework was limited to only mercury

⁴⁴ See WLWB Online Registry for [Diavik - AEMP - 2020 to 2022 Aquatic Effects Re-evaluation Report - Part 1 of 3 - May 8 24](#).

(EMAB comment 27). In response, DDMI indicated their interpretation based on the wording of the decision was to develop a Response Framework for mercury concentrations in fish tissue (Response to WLWB staff comment 22). DDMI also provided rationale to support their position as to why they consider the use of tissue concentrations in fish under the AEMP to be limited:

- The primary role of fish tissue monitoring in the AEMP is to provide the information necessary to interpret potential effects in fish health.
- The direct effects of tissue metals concentrations on fish health are poorly understood and suitable guidelines are unavailable for comparison, with exception of mercury and selenium.
- The water and sediment quality guidelines developed by CCME consider toxicity testing to determine the exposure concentrations of various metals that may potentially impact fish health; DDMI also includes the effluent toxicity testing results in the AEMP as supporting information (Response to WLWB staff comment 22).

It was DDMI's opinion that an increase in the concentration of a specific metal in fish tissue may suggest an increase in environmental exposure to that metal, but it did not necessarily equate to a detrimental effect and the detrimental effect cannot be assessed without suitable guidelines for comparison (Response to WLWB staff comment 22). DDMI further stated that fish tissue metal concentrations are useful for interpreting effects on fish health but have limited effects on their own. As such, it is DDMI's position that "effects in fish health should drive the action level assessment within the existing response framework, with fish tissue chemistry providing supporting information" (Response to WLWB staff comment 22).

The Board notes that the LWB/GNWT *Guidelines for Aquatic Effects Monitoring* (AEMP Guidelines) do not limit the use of fish tissue chemistry for interpreting fish health effects.⁴⁵ The AEMP Guidelines state the following:

Though questions are generally meant to track changes and identify cause and effect relationships used for regulatory decision-making, proponents should coordinate or balance these questions with those that help address community concerns. This will help build trust with community members and keep the AEMP relevant to those communities as well as to regulators.

DDMI's AEMP Design Plan Version 6.1 defines the objective of the fish tissue chemistry component as follows:

The objective of the AEMP fish tissue chemistry survey is to determine whether effluent discharged from the Mine has altered fish in such a way as to limit their use by humans. Fish usability can be affected by altered flavour or odour (i.e., tainting), or contaminant (e.g., metal) concentrations above consumption guidelines. In addition, body burdens of

⁴⁵ See WLWB Resources for [LWB/GNWT Guidelines for Aquatic Effects Monitoring Programs](#) (2019).

various contaminants can confirm exposure and may support potential effects observed during the fish health survey.⁴⁶

DDMI's current approved AEMP Design Plan assesses tissue chemistry in the small-bodied fish (i.e., Slimy Sculpin) and uses this as an early warning indicator of potential effects on tissue quality of all fish in the lake, including large-bodied fish (e.g., Lake Trout) and as part of the interpretation of the fish health study. An increase in tissue metal concentrations in Slimy Sculpin relative to reference conditions is used as an early warning indicator of actual effects on fish usability. In addition to the small-bodied fish tissue chemistry, DDMI assesses Lake Trout through a TK fish palatability study, which is conducted every three years. This study includes a fish tasting to confirm taste and texture have not been impacted by mining and analyzes tissue concentrations in Lake Trout. The Board agrees with DDMI that guidelines for direct comparison of fish tissue chemistry are extremely limited and the biological impact of many parameters on fish health is poorly understood; however, DDMI's approach of limiting a Response Framework only to mercury, or possibly mercury and selenium, potentially enables concentrations of all other parameters to increase essentially unchecked. Although DDMI is monitoring the fish tissue concentrations, the absence of action level triggers and defined response actions limits actual adaptive management because it is unclear when, how, or why that would be implemented.

The Board acknowledges the limitations associated with fish tissue chemistry and notes that operations-related effects are anticipated to diminish once the mine is closed. The Board has decided to approve the Response Framework for mercury at this time and requires DDMI to incorporate this in an updated AEMP Design Plan for conformity by Board staff. The Board is of the opinion that it is appropriate for the assessment of trends of other parameters to continue through the AEMP per the approved AEMP Design Plan and that incorporating the use of fish tissue concentrations under cultural use criteria may be considered. The consideration of the application of cultural use criteria as part of closure has already been required by the Board through the Decommissioning Amendment and the FCRP. The Board is of the view that the relationship between fish tissue and cultural criteria, and potential AEMP-related requirements may be considered as a result of the discussions anticipated on this subject.

- ***AEMP Design Plan Revision #7: The Board has decided to approve the Response Framework for mercury in Slimy Sculpin and requires DDMI to incorporate this in an updated AEMP Design Plan for conformity by Board staff.***

Board staff asked for additional clarification related to aspects of the Response Framework (e.g., timing of additional studies, use of a five-tiered action level approach, response actions for Action Level 5) (WLWB staff comments 23 to 27). The responses provided by DDMI answered the questions and the Board accept these responses and no further actions are required at this time.

EMAB noted that mine-related changes have been identified in the far-field area and recommended DDMI remove comparisons of the near-field area to the far-field area from the proposed triggers for Action

⁴⁶ See WLWB Online Registry for [Diavik - AEMP Design Plan - Version 6.1 - Dec 27 22](#).

Levels 1 and 2 (EMAB comment 28). In response, DDMI noted that comparison to both the reference condition report and the far-field datasets are necessary to avoid erroneously triggering Action Levels because the reference condition dataset is limited to only 2013, and does not consider the spatial, seasonal, or annual variability in these parameters (Response to EMAB comment 28). The Board agrees with DDMI's position and notes that these Action Levels are intended to be early warning and if unexpected changes are occurring, then this should be identified in other components. The Board notes that these Action Levels will be re-evaluated in the next aquatic effects re-evaluation report and may also be reconsidered through the continued development of the FCRP and associated closure criteria. As such, the Board accepts these proposed Action Levels to be sufficiently precautionary and no further changes are required at this time.

EMAB requested clarification regarding the comparison of mercury concentrations in Slimy Sculpin to the Canadian tissue residue guideline for methylmercury for the protection of wildlife consumers of aquatic biota (CCME 2000) (EMAB comment 29).⁴⁷ DDMI analyzes Slimy Sculpin for total mercury but the guideline is for methylmercury. DDMI confirmed that a conservative approach would be taken to compare the total to methylated concentrations (Response to EMAB comment 29). The Board agrees this is conservative and requires no further changes to this approach at this time.

EMAB requested clarification regarding how the regional normal range would be developed, specifically asking for the data sources to be identified and confirmation of whether it would strictly be a desktop exercise (EMAB comment 30). DDMI indicated that they anticipate this would be a desktop exercise and would consider publicly available data from other lakes in the region that would include historical data collected from the FF areas of Lac de Gras, data collected from reference lakes under the Ekati Mine AEMP (i.e., Counts Lake, Nanuq Lake, Vulture Lake), as well as data collected from Lac du Sauvage and Thonokied Lake for the Ekati Jay Project (Response to EMAB comment 30). The Board notes that DDMI would provide this information in a response plan for Board approval; the Board does not require further action at this time.

3.10 Cumulative Effects Assessment

As part of the AEMP, cumulative effects in Lac de Gras from the Diavik and Ekati Diamond Mines are assessed; this evaluation can help determine whether the effluent of the two mines interact and influence the AEMP results.

The approved AEMP Design Plan (i.e., Version 6.1) currently indicates that cumulative effects assessments are to be presented in the AEMP Annual Report for comprehensive sampling years and in Aquatic Effects Re-evaluation Reports.⁴⁸ However, misalignment in availability of the data from Ekati and Diavik has resulted in data from different years to be used in analyses (e.g., 2021 data from Ekati was compared to

⁴⁷ CCME (Canadian Council of Ministers for the Environment. 2000. Canadian tissue residue guidelines for the protection of wildlife consumers of aquatic biota: Methylmercury. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg.

⁴⁸ See WLWB Online Registry for [Diavik - AEMP Design Plan - Version 6.1 - Dec 27 22](#).

2022 Diavik data). Section 16 of the Plain Language Summary of the 2020 to 2022 Re-evaluation Report outlined several proposed updates to the AEMP Design Plan. One of these recommendations was to “report on cumulative effects in the re-evaluation reports only for both water quality and eutrophication indicators, to allow the use of same-year Diavik and Ekati data.”⁴⁹ EMAB indicated that the use of data from different years is not appropriate or effective, and supported this recommendation (EMAB comment 24). DDMI acknowledged EMAB’s response (Response to EMAB comment 24). The Board is of the opinion that DDMI has provided adequate rationale for its recommendation to include the cumulative effects assessment in Aquatic Effects Re-evaluation Reports and this change should improve interpretation of results through same-year data comparison. The Board directs DDMI to update the AEMP Design Plan for conformity by Board staff to indicate that cumulative effects assessment will only be included in Aquatic Effects Re-evaluation Reports. This update was included in Appendix B.

- ***AEMP Design Plan Revision #8: The Board directs DDMI to update the AEMP Design Plan for conformity by Board staff to indicate that cumulative effects assessment will only be included in Aquatic Effects Re-evaluation Reports.***

EMAB further commented on the cumulative effects assessment, noting that total nitrogen is not included in the assessment while other nitrogenous variables are and recommended total nitrogen also be considered (EMAB comment 10). In response, DDMI indicated that because of the similarities in patterns and relationships between total nitrogen and total Kjeldahl nitrogen concentrations reported at Diavik and Ekati, where total Kjeldahl nitrogen is a major contributor to calculated total nitrogen, the conclusions of the cumulative assessment on total nitrogen would remain the same (Response to EMAB comment 10). The Board is of the opinion that DDMI’s response is adequate and no further action related to the 2020 to 2022 Aquatic Effects Re-evaluation Report is required. The Board notes that the cumulative effects assessment takes place every three years and, as such, the Board requires DDMI to confirm that similarity in patterns and relationships between total nitrogen and Total Kjeldahl nitrogen concentrations remains consistent in the 2023 to 2025 Aquatic Effects Re-evaluation Report.


- ***Decision #14: The Board requires DDMI to confirm that similarity in patterns and relationships between total nitrogen and total Kjeldahl nitrogen concentrations remains consistent in the 2023 to 2025 Aquatic Effects Re-evaluation Report.***

3.11 Other Comments

Other comments submitted during the public review are not discussed in these Reasons for Decision because they were identified as not requiring a response (e.g., cover letter); no direction related to these comments is being provided by the Board. These included GNWT-ECC comments 1 and 2 and DDMI comment 1.

⁴⁹ See WLWB Online Registry for [Diavik - AEMP - 2020 to 2022 Aquatic Effects Re-evaluation Report - Part 1 of 3 - May 8 24](#).

Signed the 5th day of September 2024, on behalf of the Wek'èezhìi Land and Water Board



Witness



Mason Mantla
Chair, Wek'èezhìi Land and Water Board

Appendix A: Required Updates to the Aquatic Effects Re-evaluation Report #1 through #10 for Confirmation of Conformity by Board Staff

Revision No.	Description	Comment No.
1.	(a) Figures 3-5 to 3-8 have the figure footnotes defining the unit as mg/dm ² /yr = milligrams per square decimetre per year, but the y-axes are labelled as mg/dm ² /d and should be corrected per DDMI's response to read "mg/dm ² /d = milligrams per square decimetres per day."	WLWB staff-4
	(b) The geometric mean deposition rate for all years and all background stations is stated as being 47 mg/dm ² /yr on p. 40, but 43 mg/dm ² /yr on p. 70; text on p. 70 and in Table 3-5 should be corrected to 47 mg/dm ² /yr as DDMI indicated this is the correct value in its response.	WLWB staff-9
	(c) There are typographical errors among the references to AEMP versions and years when each version applied that are provided at the start of each section and in the additional version history provided in Section 5.2.1.2; these should be corrected per DDMI's response.	WLWB staff-10
	(d) Figure 6-18 is missing footnote (a) for cobalt and should be corrected per DDMI's response to read "A concentration of 566 mg/kg dw obtained at FFB-3 in 2016 was omitted from the plot."	WLWB staff-15
	(e) The strontium exceedances of the normal range are incorrectly identified in Section 10.3.2.1 and should be corrected to indicate that strontium exceeded the normal range in 2013, 2016, and 2019 in the near-field area only, and exceeded the normal range in the far-field in 2022 per DDMI's response.	WLWB staff-21
	(f) Text on p.725 should be corrected per DDMI's response to read "the currently approved biological Action Level definitions [for biomass] are appropriate for Lac de Gras and observed Mine effects on plankton. However, it is recommended that richness be removed from the Action Level definitions for plankton."	WLWB staff-28
	(g) The following minor errors were identified and acknowledged in DDMI's response: there are extra spacings on axis labels of most of Section 3 figures; the P-value for N+N in Table 3-10 should not be in bold font; and footnote (i) in Section 7.2.1 incorrectly refers to AEMP Design Plan 5.1 (Golder 2020a).	WLWB staff-29

2.	DDMI to include an explanation of why a geometric mean for dust deposition at station FFA-4 is not included for the 2019 to 2022 period.	EMAB-1
3.	DDMI to include an explanation of why dust deposition rates may have increased in recent years	EMAB-2
4.	DDMI to revise the text on p. 709 (Section 13.4, paragraph 3) regarding participants' input per DDMI's response to EMAB comment 39.	EMAB-39
5.	DDMI to revise the two sentences in Section 13.4 as identified in the response to EMAB comment 40 (item 1 of the recommendation).	EMAB-40
6.	DDMI to include additional text per response to EMAB comment 3 but modify the proposed updated text to only include references up to 2022.	EMAB-3
7.	DDMI to provide the revised analysis with the 2007 and 2016 data removed.	WLWB staff-20
8.	DDMI to provide a revised Table 10-27	n/a
9.	DDMI to include this additional clarifying text in the updated Aquatic Effects Re-evaluation Report	GNWT-9
10.	DDMI to revisit and revise the conclusions related to concentrations of bismuth, lead, and uranium in Slimy Sculpin tissue to reflect that these are mine-related.	EMAB-22

Appendix B: Required Updates to the Aquatic Effects Monitoring Program Design Plan #1 through #8 for Confirmation of Conformity by Board Staff

Revision No.	Description	Comment No.
1.	DDMI to specify the 2013 total nitrogen data is excluded from all trend analyses for the sediment component	WLWB staff-14 GNWT-4
2.	DDMI to revise the method associated with the spatial analysis of effects and Action Level assessment to include only the dissolved form of major ions.	WLWB staff-12
3.	DDMI to update the sampling procedures to reflect the changes related to sample collection at depth.	WLWB staff-16 EMAB-25
4.	DDMI to include a field profile conductivity trigger to initiate top, middle, and bottom sampling at stations beyond the currently proposed buffer stations.	WLWB staff-13 EMAB-25
5.	DDMI to include text to clarify how additional buffer stations may be added.	WLWB staff-13
6.	DDMI to confirm the Board's understanding that depth-integrated sampling for eutrophication indicators during open-water season would remain the same as detailed in the currently approved AEMP Design Plan (i.e., Version 6.1) in the conformity table.	WLWB staff-16
7.	DDMI to incorporate the Response Framework for Slimy Sculpin.	WLWB staff-22 EMAB-27
8.	DDMI to indicate that cumulative effects assessment will only be included in Aquatic Effects Re-evaluation Reports.	EMAB-24