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April 29, 2020

Angela Love, Regulatory Specialist  
Mackenzie Valley Land and Water Board  
P.O. Box 2130  
Yellowknife, NT X1A 2P6

Via Email: [angela.love@mvlwb.com](mailto:angela.love@mvlwb.com)

## Re: Notice of Exceedance of Action Levels Under the Aquatic Effects Monitoring Program (AEMP) Response Framework (MV2005L2-0015)

Dear Ms. Love:

De Beers Canada Inc. (De Beers) would like to notify the Mackenzie Valley Land and Water Board (MVLWB) of exceedances of Low Action Levels for toxicological impairment and nutrient enrichment based on the 2019 Aquatic Effects Monitoring Program (AEMP) results. Low Action Level exceedances were identified while synthesizing data collected for the 2019 AEMP under Part I of the Water Licence, MV2005L2-0015. The goal of the AEMP is to address potential Mine-related effects on the receiving aquatic ecosystem in a scientifically defensible manner.

This letter provides notice that Low Action Levels were triggered as per the Water Licence Part I Condition 7. The 2019 AEMP was conducted based on the MVLWB-approved AEMP Design Plan Version 5, which was submitted to the MVLWB in January 2016.

Complete analyses of the 2019 data are included in the AEMP Annual Report, due to be submitted to the MVLWB by May 1, 2020, including the summary of the Action Level triggers, which are included in this notification letter. On the basis of these data and the evaluation process outlined in the AEMP, Low Action Levels were triggered for water quality, sediment quality, plankton, and/or benthic invertebrates in the core lakes (i.e., Area 8, Lake N11, and Lake 410) under the Toxicological Impairment and Nutrient Enrichment hypotheses as follows:

- **Toxicological Impairment in Area 8:**

- Water Quality – calculated total dissolved solids (TDS) and chloride (ice-cover), and chloride, potassium, barium, manganese, and uranium (open-water), triggered on the basis that their 2019 lake-wide average concentrations were greater than their normal range in Area 8 and the relative difference to the reference lakes was statistically significant.
- Benthic Invertebrates – richness, diversity and *Corynocera* density triggered on the basis that their lake-wide means were below the lower bound of the normal range. Significant decreasing *before-after control-impact* (BACI) effects relative to both reference lakes were also detected in richness and diversity.

**De Beers Canada inc.**

1601 Airport Road NE Suite 300 Calgary Alberta T2E 6Z8  
Tel + 1 403 930 0991 | [www.debeersgroup.com/canada](http://www.debeersgroup.com/canada) | [info.canada@debeersgroup.com](mailto:info.canada@debeersgroup.com)  
Incorporated in Canada | Registration number: 889569596

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- **Toxicological Impairment in Lake N11:**
  - Water Quality – calculated TDS, chloride, potassium, sulphate, ammonia, nitrate, nickel, and strontium (ice-cover) and chloride, potassium, barium, and manganese (open-water), triggered on the basis that their lake-wide average concentrations in Lake N11 were greater than their normal range and the relative difference to the reference lakes was statistically significant.
  - Water Quality – manganese (ice-cover) triggered on the basis that the maximum concentration was greater than 75% of the Health Canada human health drinking water quality guideline (CDWQG).
  - Sediment Quality – copper triggered on the basis that the copper concentration at Station L1 (located closest to the effluent diffuser) was greater than the upper bound of the normal range and the interim sediment quality guideline (ISQG). Significant BACI effects relative to both reference lakes were also identified for copper.
  - Benthic Invertebrates – total density and Nematoda density triggered on the basis that their lake-wide means were below the lower bound of the normal range.
- **Toxicological Impairment in Lake 410:**
  - Water Quality – chloride, nickel, and strontium (open-water) triggered on the basis that their lake-wide average concentrations were greater than their normal range in Lake 410 and the relative difference to the reference lakes was statistically significant.
  - Water Quality – lead (ice-cover) was triggered on the basis that the lake-wide average concentration was greater than the normal range in Lake 410 and greater than 75% of the Canadian water quality guideline for the protection of aquatic life (CWQG-PAL).
- **Nutrient Enrichment in Area 8:**
  - Plankton – phytoplankton biomass and community composition, and zooplankton biomass were triggered. Phytoplankton biomass triggered on the basis that a significant press and/or pulse effect showing an overall increase compared to both reference lakes was observed for phytoplankton biomass in June/July and August. Phytoplankton community composition triggered on the basis that significant analysis of similarity (ANOSIM) results and changes in community composition were observed in two out of three sampling events, which provides an indication of an ecologically relevant change in community composition. Zooplankton biomass also triggered on the basis that significant press and/or pulse effects showing an overall increase compared to both reference lakes were observed in June/July and August.
- **Nutrient Enrichment in Lake N11:**
  - Water Quality – ammonia and nitrate (ice-cover) triggered on the basis that their lake-wide average concentrations in Lake N11 were greater than their normal range and the relative difference to the reference lakes was statistically significant.
  - Plankton – Phytoplankton biomass triggered on the basis that significant press and/or pulse effects showing an overall increase compared to both reference lakes were observed in all three sampling periods (i.e., June/July, August and September).

The 2019 AEMP results for water quality, sediment quality, plankton community, and benthic invertebrate community identified changes that may be Mine-related. However, similar to 2018, several of the Low Action Level exceedances are examples of how the current criteria identify changes that are within EIS predictions and are unlikely to represent trends toward unacceptable significant adverse effects, which is the intent of

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the Response Framework<sup>1</sup>.

The Low Action Level triggers for water quality identified changes from baseline or reference conditions but concentrations remained below AEMP benchmarks. The majority of AEMP water quality variables were also below EIS predictions. The Low Action Level trigger for sediment resulted from Action Level criteria that are too sensitive, which do not consider ISQG exceedances that also occurred under baseline conditions. Some of the Low Action Level triggers for plankton and benthic invertebrate communities also resulted from overly sensitive Action Level criteria, because a single criterion by itself (i.e., normal range exceedance, significant BACI effect, or change in community composition) can trigger an Action Level. The responses in richness and diversity in Area 8 may have been influenced by lower ice-cover DO conditions relative to the baseline sampling period.

Recommendations were made in the 2015 to 2018 Aquatic Effects Re-evaluation Report (De Beers 2019) to update the normal ranges and pre-development data by using the 2015 and 2016 water and sediment quality, plankton, and benthic invertebrate data, and adjust the Action Level criteria to reduce false positive triggers by requiring multiple criteria to be true before a Low Action Level is triggered.

When the proposed new action level condition statements in the 2015 to 2018 Aquatic Effects Re-evaluation Report (De Beers 2019) are used to evaluate the 2019 AEMP data, the majority of the low action level triggers identified in 2019 would not have been triggered. The action level triggers that would have screened in are related to the Toxicological Impairment hypothesis for water quality and benthic invertebrates, specifically:

- Water Quality – a Moderate Action Level for manganese in Lake N11 (ice-cover) triggered on the basis that the maximum measured concentration was greater than 70% of the Health Canada human health drinking water quality guideline (CDWQG).
- Water Quality – a Moderate Action Level for lead in Lake 410 (ice-cover) on the basis that the lake-wide average concentration was greater than the normal range in Lake 410, and greater than 70% of the Canadian water quality guideline for the protection of aquatic life (CWQG-PAL).
- Benthic Invertebrates – a Low Action Level for richness in Area 8 on the basis that their lake-wide means were below the lower bound of the normal range and a significant decreasing *before-after control-impact* (BACI) effects relative to both reference lakes.

While De Beers recognizes the current notification and response plan process, it is recommended that instead of preparing a response plan for all of the identified 2019 Low Action Level triggers, a response plan limited to the moderate action level triggers for water quality as per criteria proposed in the 2015 to 2018 Aquatic Effects re-evaluation Report will be submitted to the Board. All of the results for the remaining triggers will be confirmed and evaluated during the 2020 AEMP monitoring program based on the following rationale:

- Several of the Low Action Level exceedances are examples of how the current criteria identify changes that are within EIS predictions and are unlikely to represent trends toward unacceptable significant adverse effects.

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<sup>1</sup> The goal of the AEMP Response Framework is to identify the potential for significant adverse effects so that mitigation can be applied to prevent a significant adverse effect from occurring.

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- Most of the Low Action Level exceedances would not have been triggered using the recommendations made in the 2015 to 2018 Aquatic Effects Re-evaluation Report
- The MVLWB and GNWT developed new guidelines for AEMPs in the Northwest Territories (NT; MVLWB and GNWT 2019), which noted that Low Action Level exceedances no longer require submission of a response plan, and these exceedances will be reported and described in the AEMP annual reports. Only Moderate and High Action Level exceedances require submission of a response plan to the Board.

De Beers will submit an AEMP Response Plan pertaining to the action level triggers for manganese in Lake N11 and lead in Lake 410 during ice cover in 2019 by June 30, 2020, detailing the exceedances and proposed response actions.

If you have any questions regarding this submission, I can be contacted at [william.liu@debeersgroup.com](mailto:william.liu@debeersgroup.com) or (867) 445-1485.

Sincerely,



William Liu  
Regulatory Specialist  
De Beers Canada Inc.