



Environmental Protection Operations Directorate

Prairie & Northern Region

5019 52<sup>nd</sup> Street, 4<sup>th</sup> Floor

P.O. Box 2310

Yellowknife, NT X1A 2P7

ECCC File: 5100 000 013/011 & 5100 000 013/007

MVLWB File: MV2005C0032 & MV2005L2-0015

June 27, 2018

Via email to: [angela.love@mvlwb.ca](mailto:angela.love@mvlwb.ca)

Angela Love

Regulatory Specialist

Mackenzie Valley Land and Water Board

7th Floor, 4922 48th Street

P.O. Box 2130

Yellowknife, NT X1A 2P6

Dear Ms. Love:

**RE: MV2005C0032 & MV2005L2-0015 – De Beers Canada Inc. – Gahcho Kue  
Diamond Mine – March 2018 Amendment Applications Final Intervention**

Environment and Climate Change Canada (ECCC) has reviewed the information submitted to the Mackenzie Valley Land and Water Board (MVLWB) regarding the above-mentioned amendment applications and is submitting its intervention via email. ECCC's specialist advice is provided based on our mandate, in the context of the *Canadian Environmental Protection Act* and the pollution prevention provisions of the *Fisheries Act*.

Should you require further information, please do not hesitate to contact Melissa Pinto at (867) 669-4733 or [Melissa.Pinto@canada.ca](mailto:Melissa.Pinto@canada.ca).

Sincerely,

Margaret Fairbairn  
A/Regional Director

Attachment(s): ECCC's Final Intervention

cc: Georgina Williston, Head, Environmental Assessment North (NT and NU)  
ECCC Review Team



Environment and  
Climate Change Canada

Environnement et  
Changement climatique Canada



ENVIRONMENT AND CLIMATE CHANGE  
CANADA'S INTERVENTION TO THE  
MACKENZIE VALLEY LAND AND WATER  
BOARD

RESPECTING DE BEERS CANADA INC.'S  
GAHCHO KUE LAND USE PERMIT AND  
WATER LICENCE MARCH 2018  
AMENDMENT APPLICATIONS

June 27, 2018

Canada 

## Table of Contents

<b>1.0</b>	<b>List of Acronyms .....</b>	<b>3</b>
<b>2.0</b>	<b>Executive Summary.....</b>	<b>4</b>
<b>3.0</b>	<b>Environment and Climate Change Canada’s Mandate.....</b>	<b>5</b>
<b>4.0</b>	<b>Environment and Climate Change Canada’s Technical Review Comments and Recommendations .....</b>	<b>6</b>
<b>4.1</b>	<b>Effluent Quality Criteria (EQC) .....</b>	<b>6</b>
<b>4.2</b>	<b>Cadmium Site-Specific Water Quality Objective (SSWQO).....</b>	<b>8</b>
<b>4.3</b>	<b>Additional Discharge to Lake N11 in Year 5 .....</b>	<b>9</b>
<b>4.4</b>	<b>Response Framework and Action Levels .....</b>	<b>10</b>
<b>4.5</b>	<b>Canadian Ambient Air Quality Standards for NO<sub>2</sub> and PM<sub>2.5</sub> .....</b>	<b>12</b>
<b>5.0</b>	<b>Conclusion.....</b>	<b>15</b>

## **1.0 List of Acronyms**

AEMP	Aquatic Effects Monitoring Program
AQMS	Air Quality Management System
CAAQS	Canadian Ambient Air Quality Standards
CCME	Canadian Council of Ministers of the Environment
CEPA	<i>Canadian Environmental Protection Act</i>
ECCC	Environment and Climate Change Canada
EQC	Effluent Quality Criteria
IR	Information Request
MVLWB	Mackenzie Valley Land and Water Board
SNP	Surveillance Network Program
SSWQO	Site Specific Water Quality Objective
TDS	Total Dissolved Solids
WMP	Water Management Pond

## **2.0 Executive Summary**

De Beers Canada Inc. (De Beers) has submitted applications to amend their current Type A Land Use Permit (MV2005C0032) and Water Licence (MV2005L2-0015) for the existing Gahcho Kue diamond mine (the Project), which are collectively known as the March 2018 Amendment Applications. These amendments include activities related to expanding the size of the pits and waste rock storage facilities to accommodate joint sets causing unsafe bench angles. In addition, De Beers is requesting changes to effluent quality criteria for discharges from the Water Management Pond (WMP) and Area 7, and an increase in water use.

Environment and Climate Change Canada (ECCC) has participated in the March 2018 Amendment Applications review process, including submitting initial comments on the application on May 7, 2018 and attending the Technical Session held in Yellowknife on May 30 and 31, 2018. ECCC is submitting this final intervention to the Mackenzie Valley Land and Water Board for consideration as per the requirements of the *Mackenzie Valley Resource Management Act*.

ECCC has identified several outstanding issues with the proposed amendment applications. In regards to the proposed water licence amendments, ECCC is of the view that the Canadian Council of Ministers of the Environment guideline for cadmium would be more appropriate as the site-specific water quality objective rather than the Health Canada drinking water guideline. ECCC recommends that De Beers revisit the Action Levels in the Aquatic Effects Monitoring Program taking into account revised water management and water quality predictions. In addition, ECCC also recommends that De Beers verify model predictions by comparing with actual monitoring data and updating model predictions as required for discharges from the WMP to Area 7 and for Year 5 of discharge to Lake N11.

ECCC also recommends that De Beers consider how PM<sub>2.5</sub> and NO<sub>2</sub> emissions from the Project may affect ambient air quality as compared to the Canadian Ambient Air Quality Standards.

### **3.0 Environment and Climate Change Canada's Mandate**

The mandate of Environment and Climate Change Canada (ECCC) is determined by the statutes and regulations under the responsibility of the Minister of Environment and Climate Change. In delivering this mandate, ECCC is responsible for the development and implementation of policies, guidelines, codes of practice, inter-jurisdictional and international agreements, and related programs. ECCC's specialist advice is provided pursuant to the *Canadian Environmental Protection Act* (CEPA) and the pollution prevention provisions of the *Fisheries Act*.

ECCC participates in the regulation of toxic chemicals and the development and implementation of environmental quality guidelines pursuant to CEPA. ECCC also administers the pollution provisions of the *Fisheries Act*, which prohibit the deposit of a deleterious substance into fish-bearing waters.

Additional information on ECCC's mandate can be found at <https://www.canada.ca/en/environment-climate-change/corporate/acts-regulations/acts-administered.html>

## **4.0 Environment and Climate Change Canada's Technical Review Comments and Recommendations**

### **4.1 Effluent Quality Criteria (EQC)**

#### References:

Letter from De Beers to Mackenzie Valley Land and Water Board, Re: Information Requests and Commitments - Responses for the March 2018 Water License and Land Use Permit Amendment Applications; June 14, 2018

ECCC-4, De Beers Gahcho Kue - March 2018 Amendment Applications, Online Review System

De Beers' Response to ECCC-12, De Beers Gahcho Kue - March 2018 Amendment Applications, Online Review System

Technical Session Presentation – Topic 3 Effluent Quality Criteria (EQC) for Area 8 and Lake N11; May 30, 2018

#### Environment and Climate Change Canada's Conclusion:

ECCC acknowledges that De Beers Canada Inc. (De Beers) has taken a reasonable approach to evaluating parameters of potential concern that should have EQC for discharges from Area 7 to Area 8. However, the situation could arise where the option to transfer water from the Water Management Pond (WMP) to Area 7 is needed for water management.

In their response to ECCC-12 De Beers noted:

“De Beers will continue to monitor a full suite of parameters during discharge from the WMP to Lake N11 and discharge from Area 7 to Area 8 for downstream flow mitigation and report parameter concentrations in monthly surveillance network program reports.”

De Beers would either pump the water in Area 7 back to the WMP or to the bottom of a pit should water from the WMP be stored in Area 7. If De Beers stored water from the WMP in Area 7 and then wanted to discharge that water from Area 7 to Area 8 for downstream flow mitigation, an EQC re-evaluation report would be prepared and submitted to the Mackenzie Valley Land and Water Board (MVLWB).

Following the May 30-31, 2018 Technical Session, De Beers provided responses to additional Information Requests (IRs). IR1 and IR3 deal (respectively) with the option of discharge from the WMP to Area 7, and with a Year 5 discharge to Lake

N11 (currently only 4 years of discharge had been contemplated). Discharge would be predicated on the ability to meet the proposed EQC, which were identified after selecting Site-Specific Water Quality Objectives (SSWQOs) for each parameter. The IR references the EQC Report methodology for the calculation of EQCs; the assumption is that the SSWQOs in the receiving environment are maintained when discharges are at maximum average concentrations of the proposed EQC.

DeBeers has requested that the Water Licence amendment include a contingency option allowing transfer of up to 1.3 Mm<sup>3</sup> of water from the WMP to Area 7, for discharge to Area 8 for downstream flow mitigation. The proposed EQC for this option would be based on managing the concentrations in Area 7 by limiting the loadings from the WMP. To this end, additional modeling was done to look at two scenarios: Scenario A where 1.3 Mm<sup>3</sup> of water would be transferred from the WMP to Area 7 in July and August 2019, plus 0.65 Mm<sup>3</sup> in July 2026; and Scenario B, where 1.3 Mm<sup>3</sup> of water would be transferred from the WMP to Area 7 in September and October 2022, plus 0.65 Mm<sup>3</sup> in July 2026. For each scenario, four sensitivities involving various discharge volumes were run to evaluate achievability of the EQC. It is ECCC's understanding that De Beers is not proposing to have these as regulated scenarios, but is demonstrating how water quality objectives in Area 8 could be met.

Proposed EQC have been provided (Tables 1-8 and 1-9) with Maximum Average Concentrations that are expected to be consistently met for specific WMP water volumes being transferred to Area 7. De Beers proposes to have these EQC apply only in the contingency case that WMP water is transferred to Area 7.

ECCC notes that periodically Area 8 would contain 75 to 100% of Area 7 water (Slide 13, Topic 3 presentation May 30th) depending on Area 7 volumes transferred. The proposed EQC would maintain Area 8 SSWQOs for parameters which have the EQC set at or below the SSWQOs (chloride, fluoride, phosphorus, aluminum, cadmium, chromium, copper), but not for nitrate, which has the proposed EQC above the SSWQO. Because of the predicted likelihood for water in Area 8 to be above the SSWQOs for nitrate during winter due to ice exclusion, it will be necessary to identify appropriate WMP discharge volumes based on actual conditions at the time of transfer.

De Beers states that they would select the actual years of transfer and volumes to be pumped to make sure that EQC were achievable and the downstream environment remained protected. This is consistent with the goal of maintaining operational flexibility based on operating conditions.

Under the current Surveillance Network Program (SNP), water quality monitoring in Area 8 includes the end of pipe (SNP-04) plus stations at the edge of the mixing zone in Area 8 (SNP-03). These stations are only monitored during

discharge, which occurs in open water. Monitoring under the Aquatic Effects Monitoring Program (AEMP) includes 6 stations in Area 8 (Area 8-L1 to Area 8-L6), which are sampled 4 times a year, including in April when ice cover is near its maximum thickness. The data from the AEMP can be compared to water quality objectives to determine whether predictions were accurate, and to evaluate whether the EQC are appropriate. Under-ice data from the Area 8-L sites should be reported with the SNP data (noting that the April data would otherwise not be distributed until May the following year).

Environment and Climate Change Canada's Recommendations:

- a) Evaluate water volumes to be transferred from the WMP to Area 7 based on monitoring data for water quality in the WMP and Area 7, and evaluate water volumes within Area 7 and 8, to confirm that EQC are achievable and SSWQOs will be maintained in Area 8.
- b) Report April sampling results for Area 8 with the SNP data in order to confirm water quality during the time when ice cover is at its maximum thickness.

## 4.2 Cadmium Site-Specific Water Quality Objective (SSWQO)

References:

De Beers' Response to ECCC-5, De Beers Gahcho Kue - March 2018 Amendment Applications, Online Review System

Technical Session Transcript – May 30th; page 134, line 7

Environment and Climate Change Canada's Conclusion:

ECCC-5 outlined that De Beers based their SSWQO for cadmium on the Health Canada drinking water guideline, which is 100 times higher than the Canadian Council of Ministers of the Environment (CCME) Protection of Aquatic Life guideline. As predictions indicate that discharges will be approximately at the CCME guideline and concentrations at the edge of mixing zone will be below, ECCC recommended that De Beers provide rationale for using the Health Canada drinking water guideline rather than the CCME Protection of Aquatic Life guideline. In their response, De Beers indicated that the MVLWB had adopted the Health Canada drinking water guideline for total cadmium even though De Beers had proposed a lower SSWQO.

In the course of the Technical Session with the MVLWB, the Proponent, ECCC and other stakeholders, there was discussion of the origin of using the Health Canada Drinking Water guideline for the cadmium SSWQO, and it was established that the CCME guideline would be the appropriate objective to use, and would be achievable.

Environment and Climate Change Canada's Recommendation:

Use the CCME Protection of Aquatic Life guideline, rather than the Health Canada Drinking Water Guideline as the objective for cadmium in Lake N11 and Area 8.

### 4.3 Additional Discharge to Lake N11 in Year 5

References:

Letter from De Beers to Mackenzie Valley Land and Water Board, Re: Information Requests and Commitments - Responses for the March 2018 Water License and Land Use Permit Amendment Applications; June 14, 2018

Gahcho Kue Mine: Effluent Quality Criteria Report; March 2018

Environment and Climate Change Canada's Conclusion:

In the March 2018 IR Responses, De Beers states that: "The water management plan and EQC evaluation (De Beers 2018) considered discharge to October 2020 (the beginning of Year 5). The EQC proposed for discharge to Lake N11 in the EQC Report (De Beers 2018) included as Attachment 3 to the Water Licence amendment application are projected to be achievable in the later part of Year 5 (2021) for all parameters other than chloride, nitrate, total phosphorus, and total chromium. In the later part of Year 5 (2021), water management pond (WMP) concentrations are projected to remain below the proposed maximum grab concentrations (MGB) for all parameters, but are projected to exceed the maximum average concentration (MAC) for chloride, nitrate, total phosphorus, and total chromium (Table 3-1). The EQC proposed for discharge to Lake N11 are projected to be achievable for fluoride, sulphate, total ammonia, and total aluminum, copper, and iron."

Based on discharges at the EQC Maximum Average Concentration, there would be slight exceedances of the water quality objectives for phosphorus, aluminum, chromium, copper and iron during the under-ice period, for approximately one month.

De Beers proposes to maintain the EQC presented in Table 3-1 of the EQC Report, on the basis that exceedances would only occur during ice cover, and the risk of adverse effects from these brief periods of SSWQO exceedances for the listed parameters is considered low. The company has noted that modelled predictions have been done with conservative assumptions, and actual concentrations would be expected to be lower.

Annual comparisons of under-ice (i.e. worst-case) water quality in Lake N11 to modeled under-ice predictions can be done to validate model accuracy and inform water management planning. These would be useful to validate potential changes to receiving water quality in the event of a fifth year of discharge to Lake N11. Under-ice water quality sampling is done at Lake N11 at five stations every April under the AEMP; there is no winter SNP data collection.

Environment and Climate Change Canada's Recommendations:

- a) Validate predictions which have been used in developing the EQC once further operational data are available, prior to proceeding with a fifth year of discharge to Lake N11.
- b) Compare data from under-ice (i.e. worst-case) water quality monitoring in Lake N11 to modeled under-ice predictions to validate model accuracy and inform water management planning.
- c) Calibrate and update modeling if real-world data differ appreciably from predictions.

#### 4.4 Response Framework and Action Levels

References:

Gahcho Kue Mine: Aquatic Effects Monitoring Program Design Plan Version 5, Section 8; August 2015

2017 Aquatic Effects Monitoring Program Report; May 2018

Letter from De Beers to Mackenzie Valley Land and Water Board, Re: Notice of Exceedance of the Aquatic Effects Monitoring Program (AEMP) Response Framework Items (MV2005L2-0015); April 12, 2018

Environment and Climate Change Canada's Conclusion:

The ongoing monitoring and adaptive management as required under the AEMP is set up to provide an indication of any changes which may occur in the

receiving environment as a result of the discharge of effluent and the overall management of mine rock and site water. These changes are evaluated by DeBeers (Figure 8.2-1, AEMP Design Plan) and an Action Level triggered (Table 8.2-1, AEMP Design Plan) if exceedances of pre-determined thresholds are measured.

Recently, Low Action Levels were triggered for uranium in Area 8, and for Total Dissolved Solids (TDS), nitrate, barium, nickel and strontium in Lake N11. Open-water triggers were linked to operational discharges, but did not result in exceeding CCME guidelines or 75% of the AEMP benchmarks; winter exceedances were associated with cryoconcentration. De Beers concluded that negligible changes were occurring in the core lakes, and raised the concern of false positives occurring, stating that:

“The appropriateness of the Low Action Levels developed for the AEMP were evaluated again this year. Factors that may account for Action Level exceedances representing false positive triggers will be discussed in the follow up 2017 AEMP Annual Report, and recommendations will be provided for refining Action Levels to achieve an appropriate level of sensitivity to environmental change. The Aquatic Effects Re-evaluation Report and the AEMP Design Plan update will provide an opportunity to re-evaluate the Action Levels for the AEMP.” (Letter from De Beers to MVLWB dated April 12, 2018)

ECCC anticipates that this review will be done with the proposed modifications to water management and the updated water quality predictions in mind, noting that it will be important to identify changes which are both statistically and potentially ecologically significant. Maintaining appropriate sensitivity of the Action Levels in the Response Framework will provide a backstop for the uncertainty inherent in modeling predictions. While the updated modeling has been based on conservative assumptions, there may be artifacts of the model structure which don't fully predict environmental conditions. For example, the model presents whole lake averages which may understate concentrations in near-field monitoring stations. Any such receiving environment changes which hadn't been explicitly identified by the modeling would be expected to be picked up by the AEMP monitoring and data evaluation processes. The Action Levels' triggers in the Response Framework could be further refined for changes to receiving waters, along with screening for false positives (such as statistical differences which are linked to seasonal concentrations and have no ecological significance).

**Environment and Climate Change Canada's Recommendations:**

- a) Review Action Levels in the AEMP taking into account the revised predictions for water quality and water management which have been provided for the water licence amendment application.

- b) Conduct periodic updates (audits) of the water quality modeling, with the model inputs calibrated with monitoring data, and revised predictions compared to the previous ones. Any differences should be evaluated and the results considered in reviews of the AEMP and Response Framework.

#### 4.5 Canadian Ambient Air Quality Standards for NO<sub>2</sub> and PM<sub>2.5</sub>

##### References:

De Beers' Response to ECCC-16, De Beers Gahcho Kue - March 2018 Amendment Applications, Online Review System

##### Environment and Climate Change Canada's Conclusion:

Federal, provincial and territorial governments are working collaboratively to improve air quality through the implementation of the Air Quality Management System (AQMS). The Canadian Ambient Air Quality Objectives (CAAQS) are intended to be the drivers for air quality improvements across the country in order to protect human health and the environment. They are supported by air quality management levels, which call for progressively more rigorous actions by jurisdictions as air quality levels within designated air zones approach or exceed the CAAQS, thereby ensuring that the CAAQS are not treated as "pollute-up-to" levels.

While the monitors used to report on CAAQS achievement are usually located in population centres, air zones are designed to cover all geographic areas within a jurisdiction and the resulting management levels and actions may be applied across an air zone, even in remote areas. Since the CAAQS are also designed to protect the environment, the lack of a nearby human population is not a reason to discount the use of the CAAQS during an assessment. In addition, air pollutants can travel long distances and affect communities far from the initial source. Based on the most recent air zone report from the Government of the Northwest Territories, the North Slave air zone that the project is located in is currently in the "yellow" management level for PM<sub>2.5</sub>, indicating that actions to prevent air quality deterioration may be required. A comparison to the NO<sub>2</sub> CAAQS is not yet available.

Modelling data may be used to compare predicted concentrations to ambient standards, including national standards such as the CAAQS, in order to estimate the contribution of the project to local air quality. In order to assess the impact of a proposed project on ambient air quality levels, it is recommended that modelled predictions be compared to the most stringent federal, provincial or territorial air quality standards applicable to the given area. In many cases, the CAAQS will be

the most stringent levels for key air pollutants, especially for longer term projects with emissions after 2025.

Provinces and territories use the CAAQS to guide air zone management actions. While not intended to be used as standards to be achieved at the project perimeter, the CAAQS may be used in conjunction with results from air quality modelling to predict the impact of a project on downwind locations, including communities and other sensitive receptors. Modelling may also be used to estimate the potential for project emissions to influence air quality in neighbouring air zones or adjacent jurisdictions. Under the AQMS, the federal government is responsible for coordinating actions to address inter-provincial air pollution through a system of regional airsheds.

For the purposes of comparing modelled concentrations with ambient standards, it is not necessary to assess the values based on the actual statistical form of the CAAQS (e.g. a three-year average). The modelled values may be compared based upon the numerical limits and averaging times for the CAAQS, as shown in the table below. However, model results for one calendar year should be provided to allow for a basic comparison with the statistical form.

**Table 1: Values Used to Compare the CAAQS to Modelled Concentrations for Ambient Air Quality (based on most stringent standards currently available)**

<b>Pollutant</b>	<b>Averaging Time</b>	<b>Numerical Limit</b>	<b>Statistical Form for Comparison with Model Predictions</b>
Fine particulate matter	24-hour	27 ug/m <sup>3</sup>	98 <sup>th</sup> percentile of 24-hour average concentrations for the modelled year
	Annual	8.8 ug/m <sup>3</sup>	Average of all 1-hour concentrations for the modelled year
Nitrogen Oxides (NO <sub>x</sub> )	1-hour	42 ppb	98 <sup>th</sup> percentile of daily maximum 1-hour concentrations for the modelled year
	Annual	12 ppb	Average of all 1-hour concentrations for the modelled year

It is understood that De Beers has already provided a comparison of the modelled concentrations with the 2014 NWT Air Quality Standards. However, given that the project will be operating into the foreseeable future, it is preferential that modelling results be compared to the most stringent ambient standards currently applicable to the given area. In this case, the most stringent

**Environment and Climate Change Canada's Intervention to the MVLWB  
De Beers Canada Inc. – Gahcho Kue Land Use Permit and  
Water Licence March 2018 Amendment Applications**

---

ambient standards for comparison to the modelled values are the 2020 CAAQS for PM<sub>2.5</sub> and the 2025 CAAQS for NO<sub>2</sub>.

Since De Beers has already implemented an air quality monitoring program in the local area, the incremental value of estimated emissions based upon the updated project description, as predicted at the downwind monitoring stations by the air quality modelling, may be assessed and evaluated to understand the potential effects and develop measures to mitigate effects in the North Slave air zone.

Environment and Climate Change Canada's Recommendation:

Consider how NO<sub>2</sub> and PM<sub>2.5</sub> emissions from the Project may affect ambient air quality as compared to the CAAQS for NO<sub>2</sub>.

## **5.0 Conclusion**

ECCE trusts that the outstanding issues and recommendations discussed in this intervention will assist the MVLWB in further assessing the amendment applications put forth by De Beers.

ECCE's technical comments and recommendations are intended to provide expert advice, on areas within its mandate, to decisions-makers. These comments are in no way to be interpreted as any type of acknowledgement, compliance, permission, approval, authorization, or release of liability related to any requirements to comply with federal or territorial statutes and regulations. Responsibility for achieving regulatory compliance lies solely with the Proponent.