

**GOVERNMENT OF THE NORTHWEST TERRITORIES
ENVIRONMENT AND CLIMATE CHANGE
INTERVENTION**

FOR

**EKATI SABLE UNDERGROUND PROJECT
TYPE A WATER LICENCE AMENDMENT
W2022L2-0001**

SUBMITTED TO:

**WEK'ÈEZHII LAND AND WATER BOARD
#1-4905 48TH STREET
YELLOWKNIFE, NT X1A 3S3**

SEPTEMBER 4, 2024

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LIST OF ACRONYMS & ABBREVIATIONS

Aquatic Effects Monitoring Program	AEMP
Arctic Canadian Diamond Company Ltd.	Arctic
Department of Environment and Climate Change	ECC
Effluent Quality Criteria	EQC
Government of the Northwest Territories	GNWT
Information Request	IR
Sable Underground Project	SUG Project
Surveillance Network Program	SNP
Two Rock Sedimentation Pond	TRSP
Waste Rock Storage Area	WRSA
Water Quality Model	WQ Model
Wek'èezhìi Land and Water Board	WLWB or Board

SUMMARY OF RECOMMENDATIONS

- 1. GNWT-ECC recommends that, to allow Parties to understand updates to the WQ model's base case scenario, Arctic should include the following information in their response to Interventions:**
 - a) base case model inputs including water quality from the waste rock storage area (the full suite of parameters where predictions are available),**
 - b) surface water and ground water concentrations for 2025, 2025-2028 and 2029-2030 (Tables similar to those provided in Appendix A [Table 5.1 and Table 5.2] of the SUG Project Description, for the full suite of parameters where predictions are available), and**
 - c) modeled flows on a monthly basis for each season (winter, freshet, spring/summer).**
- 2. GNWT-ECC recommends the requested information in GNWT-ECC Recommendation #1 be accompanied with a direct comparison to the original base case and rationale for the adjustments.**
- 3. GNWT-ECC recommends that a schedule of the Water Licence be updated to require Arctic to validate the WQ model (i.e., a comparison of measured to modeled results) in an Annual Report (AEMP or Water Licence or other as agreed to by Arctic) to allow Parties to evaluate concentrations over all seasons on a consistent basis throughout the operation of the mine. The updated schedule should include a requirement to provide rationale for deviations from the modeled predictions and the measured data.**
- 4. GNWT-ECC recommends that the Board require weekly SNP sampling (when pumping) for Stations 0008-Sa2a and 0008-Sa2b until such time that the underground inflow rates and the WQ model have been validated with data.**
- 5. GNWT-ECC recommends that discharge from TRSP to Horseshoe Lake be limited to an average of 0.015 m³/s.**
- 6. GNWT-ECC recommends that, with respect to the TRSP to Horseshoe Lake modeling, Arctic provide in their response to Interventions the rationale for the assumption of consistent density (i.e., no consideration for groundwater density increases) and for the assumption of no accumulative effects (accumulation of contaminants) from consecutive years of discharges.**
- 7. GNWT-ECC recommends that mixing zone validation be completed and results presented through the continued submission of the TRSP Outfall Report and Plume Delineation Report, as specified in Part H, Condition 33 of the Licence.**

- 8. GNWT-ECC recommends that Arctic develop an EQC for total cobalt as total cobalt has been identified as a parameter of potential concern and the source of the parameter is connected to the WRSA (i.e., a mine component).**
- 9. GNWT-ECC recommends that the Board set the total security for the proposed SUG Project at \$1,886,252, with the total land liability set at \$1,222,670 and the total water liability set at \$663,585.**

1. Introduction

The following concerns and issues have resulted from the Government of the Northwest Territories, Department of Environment and Climate Change's (GNWT-ECC) review of submissions and responses related to the application to amend the Arctic Canadian Diamond Company Ltd. (Arctic) Water Licence (W2022L2-0001) to include underground mining at the Sable site in the scope of the Licence and update conditions to reflect the Project. This Technical Intervention details GNWT-ECC's concerns and provides recommendations for the Wek'èezhì Land and Water Board's (WLWB or Board) consideration. This submission takes into consideration the documents provided throughout the application process to date including items from the Water Licence Application and Information Request (IR) responses. GNWT-ECC appreciates the opportunity to express its concerns and provide recommendations and suggestions to assist the WLWB in making a decision related to the proposed Water Licence amendment.

1.1. Application Background

On May 29, 2024, GNWT-ECC and other parties submitted comments on the Sable Underground Project (SUG Project) Amendment Application. Arctic provided their response to the public review comments on June 5, 2024. On July 23 and 24, 2024 the WLWB hosted a Technical Session to discuss and clarify issues raised by Parties in the review of the Amendment Application. Following the Technical Session, the WLWB requested additional information from Arctic. Responses to the IRs were provided to the WLWB on July 31, 2024 with the exception of IR #2 and IR #10, for which the responses were provided on August 14, 2024.

GNWT-ECC's review in its entirety is conducted pursuant to the *Waters Act* and *Waters Regulations*, which are Territorial legislation that cover the use of water and deposit of waste in the Northwest Territories. This legislation mirrored the previous federal legislation without any substantive changes and came into force on April 1, 2014. GNWT-ECC conducted this review in part to ensure that the Water Licence Amendment Application is in accordance with s. 34 of the *Waters Act*, which identifies that an application for a licence shall be in a form and contain the information prescribed by the regulations, as set out in s. 5 and Schedule C of the *Waters Regulations*.

2. Water Quality Modelling

In Arctic's response to IR #2 on August 14, 2024, it is stated that the Two Rock Sedimentation Pond (TRSP) base case scenario was reviewed and revised for better alignment of inputs and assumptions in the water quality (WQ) model with those presented in Appendix B of the SUG Project Description. GNWT-ECC notes that water quality chemistry in both the TRSP and Horseshoe Lake are dependent on the base case inputs. In Arctic's response to IR #2, the adjustments or changes Arctic has made to the original base case are unclear. Without this clarification, GNWT-ECC is unable to evaluate the acceptability of the revised model's outputs.

GNWT-ECC believes the following information should be provided in Arctic's response to Interventions, to allow Parties to understand the WQ model updates in advance of the Public Hearing:

- base case model inputs including water quality from the waste rock storage area (the full suite of parameters where predictions are available);
- surface water and ground water concentrations for 2025, 2025-2028 and 2029-2030 (Tables similar those provided in Appendix A [Table 5.1 and Table 5.2] of the SUG Project Description, for the full suite of parameters where predictions are available); and
- modeled flows on a monthly basis for each season (winter, freshet, spring/summer).

The above should be accompanied with a direct comparison to the original base case and rationale for the adjustments. This information would allow parties to assess how the sensitivity analysis using the 75th percentile winter groundwater concentrations compare to 95th percentile freshet and 95th percentile summer concentrations provided in Arctic's response to IR#1.

Further, concerns surrounding TRSP model predictions remain due to uncertainties in the model inputs, including changes to the base case water quality, conservatism of the sensitivity analysis (how 75th percentile winter concentrations compare to 95th percentile summer and freshest concentrations), underground flow (see Section 3) and the use of the 0.015 m³/s discharge rate (see Section 4). Therefore, the Board should include a Licence requirement within a schedule for Arctic to validate the WQ model (i.e., a comparison of measured to modeled results) in an Annual Report (Aquatic Effects Monitoring Program [AEMP] or Water Licence or other as agreed to by Arctic) to allow Parties to evaluate concentrations over all seasons on a consistent basis throughout the operation of the SUG Project. Given the extent of uncertainties with model predictions, GNWT-ECC believes the updated schedule should include a requirement to provide rationale for deviations from the modeled predictions and the measured data.

Recommendation:

- 1. GNWT-ECC recommends that, to allow Parties to understand updates to the WQ model's base case scenario, Arctic should include the following information in their response to Interventions:**
 - a. base case model inputs including water quality from the waste rock storage area (the full suite of parameters where predictions are available),**
 - b. surface water and ground water concentrations for 2025, 2025-2028 and 2029-2030 (Tables similar to those provided in Appendix A [Table 5.1 and Table 5.2] of the SUG Project Description, for the full suite of parameters where predictions are available), and**
 - c. modeled flows on a monthly basis for each season (winter, freshet, spring/summer).**

- 2. GNWT-ECC recommends the requested information in GNWT-ECC Recommendation #1 be accompanied with a direct comparison to the original base case and rationale for the adjustments.**
- 3. GNWT-ECC recommends that a schedule of the Water Licence be updated to require Arctic to validate the WQ model (i.e., a comparison of measured to modeled results) in an Annual Report (AEMP or Water Licence or other as agreed to by Arctic) to allow Parties to evaluate concentrations over all seasons on a consistent basis throughout the operation of the mine. The updated schedule should include a requirement to provide rationale for deviations from the modeled predictions and the measured data.**

3. SNP Sampling

In Arctic's response to IR #8 on July 31, 2024, Arctic states that the proposed Surveillance Network Program (SNP) modifications for the Amendment Application, include updating Station 0008-Sa2 (Sable Pit Minewater) to Station 0008-Sa2a and the creation of Station 0008-Sa2b (Sable Underground Sump). Further, Arctic proposes to reduce the sampling frequency for Station 0008-Sa2a from "weekly during discharge" to "monthly during discharge" based on the rationale that there is reduced traffic, blasting and overall activity in the open pit. For the newly established Station 0008-Sa2b (Sable Underground Sump), Arctic has proposed a sampling frequency of monthly based on the rationale that "Monthly sampling frequency during pumping will be sufficient to capture the water quality from the underground sump since it is expected that there will be minimal groundwater infiltration into the underground workings". Arctic also identifies that this sampling frequency aligns with the Misery Project which has been demonstrated to be appropriate.

GNWT-ECC believes that given the concerns regarding the WQ model discussed in Section 2 of this Intervention, that weekly sampling should be retained for Station 0008-Sa2a and required for Station 0008-Sa2b for the purpose of model validation. GNWT-ECC notes that weekly sampling is only required when pumping. Therefore, based on Arctic's statement that minimal groundwater infiltration into the underground workings is expected, SNP sampling may not be required for extended periods. GNWT-ECC therefore believes weekly sampling to be a reasonable requirement at Stations 0008-Sa2a and 0008-Sa2b.

Additionally, due to other infrastructure in the area (i.e., Sable Pit) there is uncertainty surrounding the thickness, depth and structure of permafrost as discussed by Arctic in Appendix A of the SUG Project description. These concerns were not addressed in Arctic's IR #8 response and remain outstanding. GNWT-ECC finds that until underground inflow rates (discussed in Section 4) and the WQ model (discussed in Section 2) have been validated with data, GNWT-ECC cannot support a less frequent sampling regime.

Recommendation:

- 4. GNWT-ECC recommends that the Board require weekly SNP sampling (when pumping) for Stations 0008-Sa2a and 0008-Sa2b until such time that the underground inflow rates and the WQ model have been validated with data.**

4. Discharge Rate and Mixing Zone

In response to IR#4 Arctic states that the discharge rates of 0.015 m³/s and 0.1 m³/s were modeled for the TRSP and that the lower discharge rate of 0.015 m³/s was used for the TRSP modeling and sensitivity analysis completed as part of IR#2. GNWT-ECC notes that rationale was not provided regarding the use of the lower 0.015 m³/s rate compared to the 0.1 m³/s modeled rate. Additionally, as outlined in Section C of Arctic's IR #4 response, there are parameters such as nitrate which require a dilution of 6 that can only be achieved with a discharge rate of 0.015 m³/s and not the higher modeled discharge rate of 0.1 m³/s. GNWT-ECC believes the Board should limit discharge to an average discharge rate of 0.015 m³/s, as that is the discharge rate selected by Arctic for the TRSP modeling and based on that modelling is the maximum discharge which will ensure benchmarks for Horseshoe Lake are met at the edge of the mixing zone (100 m).

Additionally, in Section C of Arctic's IR #4 response, Arctic indicates that effluent density was not considered to have changed with the addition of groundwater inputs from Sable Underground to TRSP. GNWT-ECC notes groundwater typically has a greater density compared to surface water due to the higher concentrations of dissolved solutes. Changes in effluent density would therefore likely alter the CORMIX outputs and dilution calculated for Horseshoe Lake. Furthermore, the accumulative effects of consecutive years of discharges from the TRSP to Horseshoe Lake were not incorporated into the modeling. To minimize the likelihood of environmental degradation from mine related impacts and to ensure benchmarks are met at the edge of the mixing zone (100 m), Arctic should provide a rationale for the assumption of consistent density as well as rationale for the assumption of no accumulative effects (accumulation of contaminants) from consecutive years of discharges.

Finally, GNWT-ECC believes that due to concerns surrounding the rates of discharge and groundwater effluent density from SUG Project underground workings, that mixing zone validation should be required and could be accomplished through a plume delineation study with a tracer compound at the proposed discharge rate. This work should be accomplished through the continued submission of the TRSP Outfall Report and Plume Delineation Report as specified in Part H, Condition 33 of the Licence.

Recommendation:

- 5. GNWT-ECC recommends that discharge from TRSP to Horseshoe Lake be limited to an average of 0.015 m³/s.**

6. **GNWT-ECC recommends that, with respect to the TRSP to Horseshoe Lake modeling, Arctic provide in their response to Interventions the rationale for the assumption of consistent density (i.e., no consideration for groundwater density increases) and for the assumption of no accumulative effects (accumulation of contaminants) from consecutive years of discharges.**
7. **GNWT-ECC recommends that mixing zone validation be completed and results presented through the continued submission of the TRSP Outfall Report and Plume Delineation Report, as specified in Part H, Condition 33 of the Licence.**

5. Effluent Quality Criteria

In the IR #10 response, Arctic proposes effluent quality criteria (EQC) for chloride and sulfate following their screening for parameters of potential concern, as these parameters do not have EQC that apply at the TRSP under the current Water Licence. GNWT-ECC finds that the methods used to derive the EQC are acceptable, however notes that total cobalt is not included as a proposed EQC. Arctic states that the predicted concentrations of cobalt are not associated with the groundwater inflows to the TRSP.

GNWT-ECC disagrees with the exclusion of total cobalt from the proposed list of EQC noting Arctic further states in their response to IR #10 that “the predicted concentrations are driven by background concentrations and the waste rock storage area (WRSA)”. GNWT-ECC finds an EQC is required as total cobalt is associated with the WRSA (i.e. a mine component). The SUG Project will continue to add to the WRSA and that seepage from the WRSA will continue to Ulu Lake and the TRSP throughout the life of the SUG Project. Elevated concentrations of total cobalt will therefore persist with the mining of Sable underground. As well, concentrations at the point of discharge exceed the water quality objective under base case conditions. Therefore, the Board should require Arctic to develop an EQC for total cobalt.

8. **GNWT-ECC recommends that Arctic develop an EQC for total cobalt as total cobalt has been identified as a parameter of potential concern and the source of the parameter is connected to the WRSA (i.e., a mine component).**

6. Security

GNWT-ECC has reviewed Arctic’s Security Estimate submitted as part of the Amendment Application package and has provided a recommendation to update the security based on the information outlined below.

Arctic engaged with GNWT-ECC on April 4, 2024 to present the SUG Project and review Arctic’s estimated additional closure security. However, in discussions between Arctic and Parties during the July 23-24, 2024 Technical Session for the SUG Project, Arctic expressed interest in establishing a 100-person camp at the Sable site. This differed from GNWT-ECC’s

understanding and review of the proposed security estimate. Since the Technical Session, Arctic clarified in the updated response to IR #9 that a camp facility will not be required for the SUG Project. GNWT-ECC would like to acknowledge Arctic's effort in addressing the security component of this Amendment Application in their continued discussions with GNWT-ECC.

Given the revision from Arctic in response to IR #9 to not include a 100-person camp for the SUG Project, Arctic has proposed to reduce the quantity for Buildings and Equipment from 2 to 1. Arctic states that the reduction is due to the removal of the 100-person camp. GNWT-ECC does not agree with this reduction as the original estimate provided by Arctic with the Amendment Application and during the April 4, 2024 engagement included the adjustment of security for Buildings and Equipment from 1 to 2 which was representative of the increase in surface buildings and equipment for the underground mine (i.e., double). The new infrastructure for the SUG Project includes a dry facility at the Sable site (approximately up to 100-persons capacity), electrical generator(s) and electrical distribution system, a mine air fan and heaters at the single fresh air raise, air compressor proximal to the in-pit portal, and expanded operations equipment and buildings (maintenance shop, etc.). GNWT-ECC estimates the dry alone to be in the \$800,000 range for demolition and debris placement in the on-site landfill.

Without a detailed breakout of the specifics of the expected buildings and equipment, GNWT-ECC supports the submitted security estimate as-is and the retention of the "2" quantity for surface Buildings and Equipment for the SUG Project. The security assigned for new surface buildings and equipment for the underground development would be an additional amount of \$851,500.

Recommendation:

- 9. GNWT-ECC recommends that the Board set the total security for the proposed SUG Project at \$1,886,252, with the total land liability set at \$1,222,670 and the total water liability set at \$663,585.**

7. Closing

GNWT-ECC would like to thank the WLWB for providing the opportunity to submit this Intervention for the Water Licence Amendment process for the Ekati Diamond Mine. GNWT-ECC intends to appear and make representations at the public hearing.