



JAY PROJECT

ENVIRONMENT CANADA

TECHNICAL REPORT RESPONSES

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Abbreviations

Abbreviation	Definition
AEMP	Aquatic Effects Monitoring Program
CRP	Closure and Reclamation Plan
DAR	Developer's Assessment Report
Dominion Diamond	Dominion Diamond Ekati Corporation
Ekati Mine	Ekati Diamond Mine
IR	information request
MVEIRB	Mackenzie Valley Environmental Impact Review Board
NWT	Northwest Territories
Project	Jay Project
TDS	total dissolved solids
TP	total phosphorous
VC	Valued Component
WEMP	Wildlife Effects Monitoring Plan
WLWB	Wek'èezhii Land and Water Board

Units of Measure

Unit	Definition
%	percent
km	kilometre
m	metre
mg/L	milligrams per litre
mg P/L	milligrams phosphorus per litre

1 INTRODUCTION

Dominion Diamond submitted a Developer's Assessment Report (DAR) to the Mackenzie Valley Environmental Impact Review Board (MVEIRB) in November 2014. Following completion of the DAR, Dominion Diamond submitted Round 1 and Round 2 information request (IR) responses (April 7, 2015 and July 3, 2015, respectively), and attended Technical Sessions hosted by MVEIRB in Yellowknife between April 21 and 24, 2015, to address regulator and parties' questions and concerns in regard to the Jay Project (Project) and the DAR.

On July 31, 2015, Environment Canada submitted their technical report to MVEIRB for the Project outlining recommendations on remaining topics of concern. This report provides responses to those recommendations outlined in the Environment Canada technical report (Environment Canada 2015), with the intent of clarifying these remaining topics as the Project moves into the MVEIRB Hearings Phase.

2 RECOMMENDATION AND RESPONSE

2.1 Phosphorus Benchmark Concentration

2.1.1 Recommendation 1

EC recommends that the trophic status of Lac du Sauvage be maintained as oligotrophic. Additionally, EC recommends that the guideline for total phosphorus be selected to indicate a change in the trophic status of the lake from oligotrophic to mesotrophic so that effects can be evaluated before a trophic shift occurs.

2.1.2 Response 1

Dominion Diamond accepts the recommendations by Environment Canada that the trophic status of Lac du Sauvage during the Project be maintained as oligotrophic, and that the CCME (2004) upper bound trigger concentration for oligotrophic lakes (0.01 milligrams per litre [mg/L]) be used as part of the Aquatic Effects Monitoring Program (AEMP) to monitor for change in trophic status. As suggested by Environment Canada, lowering the benchmark to the upper bound of oligotrophic status will provide a more appropriate basis for oversight regarding responses and decisions to increases of phosphorus in Lac du Sauvage, if required.

As presented in the DAR, and more recently in the Updated Assessment Case and Reasonable Estimate Case (Golder 2015), projected total phosphorous (TP) concentrations will be higher than existing TP concentrations in Lac du Sauvage. Measured TP concentrations in Lac du Sauvage range from 0.0026 to 0.018 milligrams phosphorus per litre (mg P/L; $n = 267$; median = 0.006 mg P/L); projected TP concentrations will range up to 0.012 mg P/L (see Round 1 IR response DAR-MVEIRB-IR-26), which is above the CCME (2004) oligotrophic trigger range. Increases in TP concentration in Lac du Sauvage are primarily associated with minewater discharge from the Misery Pit during the last five years of mine operation (2024 to 2029), with maximum TP concentrations expected to occur in the final year of discharge. Modelled TP projections for Lac du Sauvage under the Environmental Assessment Case were determined to not result in significant adverse effects to water quality (Section 8 of the DAR) or fish and fish habitat (Section 9).

A key point presented in the DAR, and at the Project Technical Sessions, is the conservatism associated with the source term input for TP in the Misery Pit discharge water quality modelling. The primary source of TP from Project activities is groundwater flowing into Jay Pit, which is subsequently pumped to the Misery Pit. As described in information provided throughout the assessment process (e.g., Section 8.8.6.3.1 of the DAR and IR responses to DAR-KIA-IR-106, DAR-EC-IR-19, DAR-EC-IR2-03), Dominion Diamond believes the projected TP concentrations in Misery Pit discharge water have been overestimated and thus are higher than can be reasonably expected; thus by extension, the projected TP concentrations in Lac du Sauvage are also overestimated. TP concentrations will be verified through monitoring of Misery Pit and Lac du Sauvage during operations through the Surveillance Network Program and AEMP monitoring programs.

The change in TP concentrations in Lac du Sauvage as a result of the Project is limited to the period of minewater discharge. Following the cessation of discharge, TP concentrations are projected return to previous conditions within three to four years after discharge activities; this rapid return is consistent with evidence from other northern oligotrophic lakes enriched with nutrients that have returned to baseline

concentrations within a couple of years after the cessation of nutrient enrichment (Schindler 1974, 2012; Welch et al 1989; O'Brien et al. 2005).

2.2 Effects Study Area for Fish and Fish Sampling Program

2.2.1 Recommendation 2

- The effects study area and the proposed sampling program under the AEMP be aligned. Given the Proponent's current proposal to sample only small bodied fish as a surrogate for effects on the large bodied fish, EC recommends that the effects assessment area for the fish valued component be reduced from the outlet of Lac de Gras to the outlet of Lac du Sauvage. If large bodied fish are to be sampled, a larger effects assessment area may be appropriate.
- Additional details regarding the AEMP study design, including fish, reference lakes, and sampling locations, be provided as well as timelines be determined regarding when the Proponent should provide this information in order to assess whether the study design will be able to detect potential effects to the receiving environment and valued components.

2.2.2 Response 2

The results of the environmental assessment presented in the DAR were used to guide the development of monitoring programs, such as the AEMP, including the location of sampling sites and selection and use of monitoring species. As the environmental assessment and monitoring programs may have different purposes, it is not necessary that the study boundaries be exactly aligned. It is more important that the monitoring program (AEMP) be designed to meet its specific objectives. It is also important that the monitoring program be designed and regulated such that it is able to adequately evolve over time in response to ongoing data collection and analysis; this is why Dominion Diamond continues to recommend that details pertaining to the AEMP be established and regulated through the Wek'èezhìi Land and Water Board (WLWB), which is the regulatory body that is able to oversee the necessary evolution of the program over time.

The selection of the boundary for assessing residual effects for fish Valued Components (VCs) (the Effects Study Area) is described in Section 9.1.4.2 of the DAR, with additional detail and justification provided in IR responses DAR-GNWT-IR-49 and in DAR-GNWT-IR2-03. The Effects Study Area for the environmental assessment is defined by the biological properties of the fish VCs (i.e., Arctic Grayling, Lake Trout, and Lake Whitefish) and considers the physical properties of the environment in which the VCs occupy to fulfil their life history requirements. Lac de Gras was included within the effects assessment due to the high potential for movement of fish VCs between Lac du Sauvage and Lac de Gras, and as such, to capture the maximum spatial extent of potential effects from the Project. Furthermore, the inclusion of Lac de Gras within the assessment boundary also allowed for assessment of not only incremental effects due to the Project, but also cumulative effects from existing and reasonably foreseeable developments in the Lac de Gras watershed. As described in the DAR and the IR responses, residual effects to fish VCs from potential changes to habitat quality and quantity in Lac du Sauvage were assessed and described in Section 9 the DAR.

A Conceptual AEMP Design Plan (the Plan) for the Project was submitted to MVEIRB on June 1, 2015 (Dominion Diamond 2015a). This Plan provides an overview of the scope of monitoring to be added to the existing Ekati Mine AEMP and describes anticipated monitoring for the first iteration of the AEMP that

covers dewatering and early operations (2016 to 2019). The proposed sampling areas are described in Section 8.3 of the Plan. The predicted zone of influence during the construction and early operations phases includes the Project footprint and the Lac de Gras watershed, including Lac du Sauvage, Lac de Gras, and the small lakes and streams located in close proximity to the Project infrastructure. These areas form the basis of the AEMP as it will be implemented during Project activities that include construction of the dike and dewatering of the diked area of Lac du Sauvage; therefore, AEMP monitoring will initially be focused in Lac du Sauvage because there is no planned effluent discharge that would affect Lac de Gras. Additional monitoring areas may be added to the AEMP during future iterations of the Plan, as appropriate, to address Project activities associated with the late operations phase.

To minimize mortality to large-bodied fish, monitoring of small-bodied fish has been proposed as a surrogate to conducting a lethal large-bodied fish program (Section 7.5.1 of the Plan). Additionally, environmental impacts should be identified in small-bodied fish before they are detected in top predators such as Lake Trout (Munkittrick 1992). Reducing the number of large-bodied fish killed through sampling programs is already a part of the Ekati Mine AEMP and other AEMPs in the Northwest Territories (e.g., Diavik and Gahcho Kué mines; Golder 2013; De Beers 2015). However, if changes in small-bodied fish health are detected that would indicate potential effects on large-bodied fish, then monitoring of large-bodied fish would be considered through the Response Framework.

As described in Dominion Diamond's July 24, 2015 letter to MVEIRB on engagement on monitoring and management plans, the AEMP is directly regulated under the Ekati Mine Water Licence by the WLWB, and as such, the established WLWB processes will be followed for regulatory and community engagement. Dominion Diamond intends to conduct an AEMP engagement workshop with interested parties prior to submission of the final plan to the WLWB.

2.3 Post-closure Water Quality in Misery Pit

2.3.1 Recommendation 3

EC recommends that the Proponent identify mitigation measures to minimize levels of contaminants in the Misery pit for the closure period, as Misery will be discharging in to Lac de Gras in perpetuity. A contingency plan which identifies feasible treatment and/or management methods for the closure stages should be developed and uncertainties should be minimized to the extent possible.

2.3.2 Response 3

If required, based on Project operational water quality monitoring results and updated long-term water quality modelling predictions, Dominion Diamond would implement additional mitigation to manage levels of water quality constituents in the Misery Pit during post-closure to acceptable concentrations (as determined in the future by the WLWB). Dominion Diamond has demonstrated that varying the depth of the freshwater 'cap' in the Misery Pit for closure would be an effective contingency measure and may be the most effective mitigation on the closure concentrations of water quality constituents generated from the Project, if required (see summary description below). Site-specific water quality and other environmental data in Misery Pit gathered over the 10-year operating life of the Project will be used to update the long term water quality predictions and to determine the optimal depth of the freshwater cap. The optimal depth may be greater or less than the 60 metres (m) that has been identified through modelling to date. This work can only be conducted in future once site-specific data are available, and

therefore, Dominion Diamond plans to undertake this optimization study for the Ekati Mine Final Closure and Reclamation Plan (CRP) for approval of the WLWB. The Ekati Mine Water Licence requires that the Final CRP be provided to the WLWB for approval 2 years prior to closure.

As noted in Dominion Diamond's response to information request DAR-GNWT-IR2-06, the post-closure surface water quality in the Misery Pit is a function of the following two processes:

- mixing of water stored in the monimolimnion with the overlying mixolimnion; and,
- runoff from the wall rock exposed above the final Misery pit lake elevation.

In the response to DAR-EC-IR2-02, Dominion Diamond identified six constituents modelled to increase to concentrations greater than the generic guidelines for the protection of aquatic life, trophic status, or aesthetic drinking water: total dissolved solids (TDS), TP, copper, iron, manganese, and mercury. Detailed water quality modelling of the Misery Pit indicated that TDS concentrations in the pit after closure (i.e., following back-flooding) are related to water stored in the mixolimnion mixing with water stored in the monimolimnion, whereas, increases of metals concentrations during post-closure are a result of loading originating from metasediment in wall rock that remains exposed above the final water elevation. TP concentrations increase as a result of both of these sources.

These closure constituent concentration projections are not limited to the DAR and updated modelling results (Dominion Diamond 2015b). Prior to the Jay Project assessment (i.e., in the absence of the Project), with the exception of mercury, which was not included in the model, Rescan (2013) predicted these same constituents, including TP, would be present in the closure scenario for the Misery Pit at concentrations greater than water quality benchmarks. Rescan (2013) concluded "there is evidence that current pit wall runoff predictions for meta-sediment may be high and with additional research there is some confidence that future predictions may show that water quality in the surface layers of these pit lakes will also be below Water Quality Benchmarks" (page ii).

During the development of the Project water management plan for the DAR, 30 and 60 m freshwater caps were evaluated in the Misery Pit post-closure water quality model. The results of this assessment indicated that a deeper freshwater cap in the Misery Pit minimized the amount of mixing between the mixolimnion and the monimolimnion; the 60 m cap was, therefore, carried forward into the assessment since it resulted in lower surface water constituent concentrations in the Misery Pit discharge to Lac de Gras during post-closure. Following this assessment outcome, constituent concentrations in the mixolimnion that are sourced from water being displaced from the monimolimnion could be further limited if necessary through increasing the depth of the freshwater cap in the Misery Pit. The optimal size of the freshwater cap required to achieve the desired closure water quality criteria will depend on the actual conditions observed in the Misery Pit (i.e., site-specific data collected during operations). Therefore, for the Final CRP to be approved by the WLWB, Dominion Diamond will update water quality predictions and determine the optimal depth of freshwater cap.

Water quality modelling of the Misery Pit included in the DAR and subsequent updates, and previous modelling of the Misery Pit completed by Rescan (2013), were based on conservative assumptions. Therefore, it is appropriate and recommended that final optimization of the pit closure condition be based on site-specific data collected during mine operations.

2.4 Waterbird By-catch

2.4.1 Recommendation 4

EC supports the development of a diving bird mitigation strategy to prevent or minimize incidental take during fish-out activities in the final fish-out plan. EC looks forward to reviewing and providing input to the Proponent in its development. The effectiveness of proposed mitigation measures will need to be monitored to trigger an adaptive management response and inform future fish-outs.

2.4.2 Response 4

As described in the responses to information requests DAR-EC-IR-25 and DAR-IEMA-IR-20, Dominion Diamond will develop a final detailed fish-out plan prior to implementing the fish-out within the diked area in Lac du Sauvage; Dominion Diamond will develop a diving bird mitigation strategy as part of the fish-out plan, and will engage with Environment Canada on its development. Dominion Diamond recently completed a successful fish-out of Lynx Lake without injury or mortality to waterbirds. The diving bird mitigation strategy was based on review of learnings from other fish-outs and in consultation with Environment Canada.

An important element of the Jay Project Fish-Out Plan will be determining the effectiveness of mitigation through monitoring to adaptively manage effects to waterbirds. Dominion Diamond will monitor the fish-out for the Project to determine the effectiveness of mitigation actions for waterbirds so that lessons learned can be applied to future fish-outs, such as, lessons learned that were applied to the Lynx fish-out.

2.5 Avoiding Incidental Take of Migratory Birds

2.5.1 Recommendation 5

- Consult the fact sheet "Planning Ahead to Reduce Risks to Migratory Bird Nests" available at: <http://www.ec.gc.ca/paom-itmb/>
- Avoid clearing land during the migratory bird nesting season.
- In the event that clearing or disturbance cannot be scheduled outside of the nesting season, using a scientifically sound approach determine the likelihood of nesting birds. If necessary, using non-intrusive search methods conduct an area search for evidence of nesting before clearing.
- Surveys should be carried out by an avian biologist or naturalist with experience with migratory birds and migratory bird behaviour indicative of nesting (e.g. singing birds, alarm calls, distraction displays, carrying nesting material or food, etc.).
- Include EC's recommended sensitive nesting period and setback distances for tundra nesting birds and species at risk in their WWHPP and WEMP.
- Include monitoring of the effectiveness of mitigation measures (including results of area searches for evidence of nesting) in their WEMP and annual report.
- Continue the monitoring and reporting of wildlife mortalities, including migratory birds to inform mitigation measures and allow for adaptive management.

2.5.2 Response 5

The Wildlife Effects Monitoring Plan (WEMP) includes mitigation for avoiding and reducing risks to migratory birds and nests, such as using bird deterrents on power lines and managing clearing of vegetation activities to comply with the *Species at Risk Act* and *Migratory Birds Convention Act* (Section 4.3.1; Appendix D). If clearing vegetation is required during the nesting period, then Dominion Diamond would implement mitigation and monitoring actions consistent with the approach recommended through engagement with Environment Canada. Monitoring for the effectiveness of mitigation actions for adaptive management of mine-related effects to wildlife is a key element of the WEMP (Sections 2.2 and 4.5). The WEMP will also monitor and report annually direct mine-related wildlife incidents and mortalities, including migratory birds (Sections 5.3 and 5.4).

2.6 Migratory Bird Use of Mine-altered Water

2.6.1 Recommendation 6

- As a precautionary measure, surveys of mine-altered waterbodies should be carried out. A professional wildlife biologist should be involved in the design of surveys, or other measures to ensure that the survey design is appropriate for the detection of local migratory bird species. This would allow for quick implementation of additional mitigation measure (e.g. deployment of deterrents) if toxicity thresholds are exceeded.
- Monitoring results should be included in annual monitoring reports and EC should be notified of any incidents involving injury or mortality of a migratory bird (also related to Issue 7 below).

2.6.2 Response 6

Water quality and other environmental characteristics of mine-altered waterbodies is an existing requirement of the Ekati Mine Water Licence that is anticipated to continue and to be expanded as necessary to incorporate the Project. Environmental information collected through the Water Licence will continue to be used to characterize mine-altered waterbodies as part of migratory bird surveys that are conducted under the direction of professional wildlife biologists through the WEMP. This approach enables timely implementation of migratory bird mitigation measures, if necessary.

Migratory bird monitoring results related to mine-altered waterbodies will be provided in the annual WEMP report. The WEMP will also monitor and report annually direct mine-related wildlife mortalities, and any migratory bird mortalities would be directly reported to Environment Canada (Section 5.3).

2.7 Species at Risk

2.7.1 Recommendation 7

Table 2 includes the list of terrestrial species at risk that may be encountered in the Birds Effects Study Area. These include species that have been assessed as being at risk by COSEWIC or are on Schedule 1 of SARA. EC anticipates that the GNWT will provide expertise as to the adequacy of the information provided, and the mitigation and monitoring measures proposed for Peregrine Falcon, Short-eared Owl, Grizzly Bear and Wolverine.

Table 2: Terrestrial species at risk with ranges that overlap with the Ekati Birds Effects Study Area.

Terrestrial Species at Risk ¹	COSEWIC Designation	SARA Status	Government Organization with Primary Management Responsibility	Recovery Strategy, Action Plan or Management Plan posted on the Species at Risk Public Registry
Peregrine Falcon (<i>anatum-tundrius</i> complex)	Special Concern	Schedule 1, Special Concern	GNWT	ManagementPlan- Proposed
Rusty Blackbird	Special Concern	Schedule 1, Special Concern	GNWT	Management Plan - Proposed
Short-eared Owl	Special Concern	Schedule 1, Special Concern	GNWT	
Grizzly Bear (Western population)	Special Concern	No Status	GNWT	
Red-necked Phalarope	Special Concern	No Status	EC	
Wolverine	Special Concern	No Status	GNWT	

Notes:

Fisheries and Oceans Canada has responsibility for aquatic species.

Environment Canada (EC) has a national role to play in the conservation and recovery of Species at Risk in Canada, as well as responsibility for management of birds described in the *Migratory Birds Convention Act* (MBCA). Day-to-day management of terrestrial species not covered in the MBCA is the responsibility of the Government of the Northwest Territories (GNWT).

- If species at risk listed in Table 2 above or their nests and eggs are encountered during project activities the primary mitigation measure for each species should be avoidance. The species-specific nest setback distances recommended by EC in Issue 5 should be used as a basis to determine zones of avoidance. Monitoring should be undertaken to ensure that mitigation measures are successful and the results of monitoring should be provided to the relevant agency with management responsibility for each species.
- The Proponent should ensure that mitigation and monitoring strategies are consistent with any applicable COSEWIC assessment status report, SARA recovery strategy, action plan and management plan that may become available during the duration of the project and should consult with the GNWT and EC on adaptive management strategies should they be required.
- Monitoring of migratory birds continues through the North American Breeding Bird Surveys and sampling effort is increased for incidental observations of birds to allow detection of species of conservation concern that may be using different habitat types. Incidental observations should continue to be reported in the annual monitoring report and EC also encourages the Proponent to submit this data to eBird (www.eBird.org) as a contribution to northern bird conservation and inform possible species distribution changes.

2.7.2 Response 7

Mitigation and monitoring strategies for listed species (per Environment Canada Table 2 above) will be consistent with any final and applicable COSEWIC assessment status report, SARA recovery strategy, action plan, and management plan that may become available during the duration of the project. Dominion Diamond will consult with the GNWT and Environment Canada on adaptive management strategies should they be required, including the implementation of setback distances for established nests and monitoring the success of such nests.

Pit wall monitoring for nesting raptors is a component of the WEMP (Section 5.10.1). Mitigation for raptors nesting in active and inactive pits is provided in Section 4.3.1. If a bird successfully nests in an active pit, ENR will be contacted to discuss a buffer zone that will be applied to the nest where no work can be undertaken.

Monitoring for upland breeding birds (includes migratory birds) is a component of the WEMP and includes recording and reporting incidental observations (Section 5.12.1) and the North American Breeding Bird Survey (Section 5.12.2). Data would be submitted to eBird. In addition, rare and uncommon species will be recorded as part of the WEMP (Section 5.13).

3 REFERENCES

- CCME (Canadian Council of Ministers of the Environment). 2004. Canadian Water Quality Guidelines for the Protection of Aquatic Life: Phosphorus: Canadian Guidance Framework for the Management of Freshwater Systems. Canadian Environmental Quality Guidelines, 2004. Winnipeg, MB, Canada.
- De Beers (De Beers Canada Inc.). 2015. Gahcho Kué Aquatic Effects Monitoring Program Design Plan Version 4. May 2014.
- Dominion Diamond (Dominion Diamond Ekati Corporation). 2015a. Conceptual Aquatic Effects Monitoring Program Design Plan for the Jay Project. Prepared for Dominion Diamond Ekati Corporation by Golder Associates Ltd. June 1, 2015.
- Dominion Diamond. 2015b. Jay Project – Compendium of Supplemental Water Quality Modelling. April 2015.
- Environment Canada. 2015. Technical Report, Jay Project, EA1314-01. Submitted to the Mackenzie Valley Environmental Impact Review Board, July 2015. Yellowknife, NWT, Canada.
- Golder (Golder Associates Ltd.). 2013. Diavik Diamond Mines Inc. Aquatic Effects Monitoring Program Study Design Version 3.2. October 2013.
- Golder. 2015. Jay Project - Compendium of Supplemental Water Quality Modelling. Submitted to Mackenzie Valley Environmental Impact Review Board. April 2015. Yellowknife, NWT, Canada.
- Munkittrick KR. 1992. A review and evaluation of study design considerations for site-specifically assessing the health of fish populations. *Journal of Aquatic Ecosystem Health* 1: 283-293.
- O'Brien JW, Barfield M, Bettez N, Hershey AE, Hobbie JE, Kipphut G, Kling G, Miller M. 2005. Long-term response and recovery to nutrient addition of a partitioned arctic lake. *Freshwater Biol* 50: 731-741.
- Rescan (Rescan Environmental Services Ltd.). 2013. Ekati Diamond Mine. Modeling Predictions of Water Quality for Pit Lakes. November 2013. Project #0194118-0202.
- Schindler DW. 1974. Eutrophication and recovery in experimental lakes: implications for lake management. *Science* 184: 897-899.
- Schindler DW. 2012. The dilemma of controlling cultural eutrophication of lakes. *P Roy Soc B-Biol Sci* 279: 4322-4333.
- Welch HE, Legault JA, Kling HD. 1989. Phytoplankton, nutrients, and primary production in fertilized and natural lake at Saqvaquac, N.W.T. *Can J Fish Aquat Sci* 46: 90-107.